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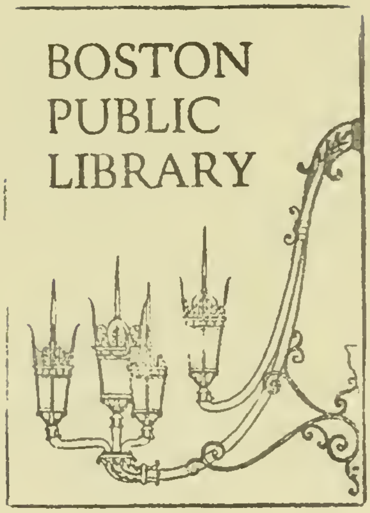

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# REPORT ON
# PRELIMINARY GEOTECHNICAL STUDIES
# PROPOSED ROWES/FOSTERS WHARF DEVELOPMENT
# BOSTON, MASSACHUSETTS

**HALEY & ALDRICH, INC.**
Consulting Geotechnical Engineers and Geologists
Cambridge, Massachusetts

WATERFRONT
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# REPORT ON
# PRELIMINARY GEOTECHNICAL STUDIES
# PROPOSED ROWES/FOSTERS WHARF DEVELOPMENT
# BOSTON, MASSACHUSETTS

for
The Beacon Companies
One Post Office Square
Boston, Massachusetts

File No. 5072

January 1983

HALEY & ALDRICH, INC.

238 Main Street
P.O. Box 60
Cambridge, MA 02142
Tel. 617/492-6460

Consulting
Geotechnical Engineers
and Geologists

Harl P. Aldrich, Jr.
Thomas K. Liu
Edmund G. Johnson
Martin C. Murphy
David E. Thompson
Edward B. Kinner

Peter L. LeCount
Douglas G. Gifford
Joseph J. Rixner
Richard P. Stulgis
John P. Dugan, Jr.
Wesley E. Stimpson

28 January 1983
File No. 5072

The Beacon Companies
One Post Office Square
Boston, Massachusetts 02109

Attention: Dr. James M. Becker

Subject: Proposed Rowes/Fosters Wharf Development
Boston, Massachusetts

Gentlemen:

We are pleased to submit herewith this report summarizing geotechnical engineering studies for your use in planning the proposed development of the Rowes/Fosters Wharf site. Bearing in mind that available information on site and subsurface conditions is very limited, this study of probable site preparation and foundation construction requirements is very preliminary. An extensive field investigation and further engineering studies will be necessary in conjunction with final design.

Based on the layout of the development which has been provided by you and Skidmore, Owings and Merrill (Architect), a general concept of the foundation design system and associated construction program has been established. In addition, an estimate of "premium" construction costs associated with the geotechnical aspects of your proposed development is included.

Thank you for the opportunity to undertake this study. If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely yours,
HALEY & ALDRICH, INC.

Charles R. Nickerson
Staff Engineer

Edmund G. Johnson
Senior Vice President

CRN:EGJ:mk
Enclosure

Affiliate:
H & A of New York
Rochester, New York

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in Separate envelope

# I. INTRODUCTION

## 1-01. GENERAL

This report presents the results of evaluations of the geotechnical aspects of designing and constructing the proposed development as planned by The Beacon Companies. The waterfront parcel, which is located immediately east of Atlantic Avenue and south of the Harbor Towers Complex in Boston, is shown on the Project Locus, Figure 1. These evaluations have included an assessment of the factors affecting site preparation, foundation design and proposed construction, as well as a determination of "premium" foundation costs related to development at the subject site.

During the course of this work, The Beacon Companies (TBC) and Skidmore, Owings and Merrill (SOM), Architect, have provided the design concept and layout of the above-ground facilities plus below-ground parking requirements. Based on this information, Haley & Aldrich, Inc. (H&A) has provided preliminary recommendations and criteria for building foundation systems. Subsequent changes to the project design have been made to accommodate the constraints of both the site and proposed development as they were identified.

The anticipated subsurface conditions on this site will present a variety of obstacles to construction. However, it is considered that with proper design and construction procedures, the proposed development of the waterfront land is technically feasible.

## 1-02. AUTHORIZATION

Geotechnical services for final stage design and development proposal purposes were conducted in accordance with the request of Ms. Carol Gladstone on 23 November 1982, and subsequent meeting and telephone discussions.

## 1-03. LIMITATIONS

No subsurface investigations have been made to date for this project. The analyses and conclusions presented in this report are based, in part, on the site and subsurface conditions as inferred from very limited available data. Variations between site and subsurface conditions as presently interpreted and as disclosed by future explorations should be anticipated. The nature and extent of these variations may not become evident until construction. If during future studies such variations then appear evident, it will be necessary to re-evaluate the conclusions made in this report.

In the event that changes in the nature, design, geometry or site location of the proposed Rowes/Fosters Wharf development are made, the interpretations and conclusions contained in this report shall not be considered valid unless the changes are reviewed by Haley & Aldrich, Inc. and the conclusions of this report are modified or verified in writing.

This report has been prepared for the exclusive use of The Beacon Companies for specific application to their proposed development of Rowes/Fosters Wharf in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

## 1-04. SUPPLEMENTAL INFORMATION

In July 1982 a report was prepared by H&A entitled, "Geotechnical Data Report, Summarizing Available Subsurface Information, Rowes and Fosters Wharves, Atlantic Avenue, Boston, Massachusetts". Subsequently, H&A was engaged to undertake engineering evaluations and "premium" cost studies with specific application to the proposed development by TBC: the results were presented in a letter dated 6 January 1983. Pertinent information presented in the above-noted report and letter have been included in this report.

## 1-05. ELEVATION DATUM

Elevations used in this report are in feet and referenced to the Boston City Base datum, wherein El. 0.0 is 5.65 ft. below National Geodetic Vertical Datum, (USC&GS MSL of 1929).

# II. SITE AND SUBSURFACE CONDITIONS

## 2-01. GENERAL

Readily available information concerning subsurface soil and rock conditions at Rowes/Fosters Wharf are summarized herein. The locations of test borings from five sources are shown on Figure 2. The logs of these explorations are included in Appendix A, and pertinent data are summarized in Table I. Finally, data concerning tide levels at Commonwealth Pier in Boston, including the frequency of occurrence of high storm tides, are summarized in Table II.

## 2-02. SITE CONDITIONS

Surface conditions at the site consist of asphalt-paved parking areas; wood, steel, granite and concrete masonry seawall bulkheads of unknown depth and conditions: deteriorated wood pile-supported deck structures inboard of the bulkheads; and wood pile-supported marginal wharves, sections of which are in poor condition or non-existent. The seawall bulkhead exists along most of the water's edge irregularly traversing the site as indicated on Figure 2. Additional old bulkhead walls may also be buried within the filled land area. Beneath the pile-supported deck structures, voids are typically present. At one location, at the northwest corner of the site, a void of up to 14 feet was measured.

The ground surface varies from approximately El. 19 at Atlantic Avenue, down to about El. 15 along the bulkhead areas. The water depth within previously dredged boat slips and outboard of the bulkhead, in general, is not known.

## 2-03. SUBSURFACE CONDITIONS

Test boring information from four H&A projects located adjacent to the site was assembled from the files. Logs of three 1973 borings within or immediately adjacent to the site were obtained from the Boston Redevelopment Authority. The locations of explorations from these five sources are shown on Figure 2, and boring logs are included in Appendix A.

Published subsurface information compiled by the Boston Society of Civil Engineers (BSCE) include test borings on the site. However, the BSCE logs or locations are believed to be in error. The subsurface data do not compare with the more recent H&A project data. Therefore, the BSCE logs are not included herein.

Based upon the available subsurface information, subsoils overlying bedrock include the following major strata:

- Miscellaneous Fill
- Organic Silt and Peat
- Clay
- Glacial Till

The above sequence reflects the mode of deposition of the soils. One or more of the units may be absent at specific locations within the site area.

The various strata encountered are discussed below in reverse order. The relationship of these materials and detailed descriptions are shown on the test boring logs included in Appendix A. A summary of pertinent test boring information in the area is included in Table I.

Bedrock. The bedrock underlying the site is known locally as Cambridge Argillite. The rock consists of weathered, soft to moderately hard, fractured, gray amorphous Argillite.

Glacial Till. The advance of the glacial ice sheets over the New England area during the Pleistocene Epoch resulted in the deposition of an unsorted mixture of clayey sand and gravel, typically referred to as glacial till, which was deposited over the bedrock surface. Numerous cobbles and boulders have been found to exist within this layer. The glacial till in this area is believed to be associated with the Fort Hill drumlin located to the west of the site.

Clay. Following the retreat of the glacial ice sheet and a rise in sea level which inundated the site, fine grained materials were deposited. These materials settled out of suspension from meltwater streams to form the clay or marine deposits. The clay deposit consists of stiff to very stiff, yellow-brown silty clay grading with depth to stiff or medium stiff, gray silty clay. Occasional sand lenses or sand seams are encountered within the stratum.

At some of the borings, a thin layer of sand was observed to overlie the clay deposit, but the data did not indicate that it was continuous over the site area.

Organic Silt and Peat. Following depositon of the clay soils during the glacial age, two different types of organic deposits formed throughout the harbor area:

- Organic silt with shells, deposited in salt water by tidal action.

- Salt marsh peat, which accumulated along the shore line of a slowly rising sea.

It is probable that the upper surface of the organic deposits was previously higher than that encountered in the available borings. This is attributable to compression and displacement under the weight of the overlying fill and possible removal during dredging for development of the harbor area.

Miscellaneous Fill. With development of the harbor area during and following 17th century, many waterfront structures were built out into the harbor. The shoreline once ran approximately parallel to and east of Atlantic Avenue, which is indicated on Figure 2 as the Primitive Low Water Line.

The site area has been partially filled during the development of harbor-related facilities. The fill consists of an unsorted mixture of sand, gravel, silt, clay, wood, brick, glass, granite blocks, etc. Numerous wood piles which supported wharves and old structures can be expected to occur in the filled areas.

## 2-04. GROUNDWATER CONDITIONS

Water levels encountered in the test borings are given on the boring logs presented in Appendix A. The water levels measured in the test borings indicate that groundwater fluctuates with the mean tide level in Boston Harbor, typically ranging between El. 1.0 and 10.5. An extreme storm high tide of El. 15.65 was recorded in February 1978. A summary of tide levels at Commonwealth Pier is presented in Table II.

# III. FOUNDATION REQUIREMENTS FOR STRUCTURES

## 3-01. GENERAL

The available subsurface information indicates that near-surface conditions can best be described as "complex", due to the past dredging, filling, and wharf and building construction at this site. With reference to Figure 3, the contours of the top of inorganic soil, as inferred from available borings, are shown. The top of inorganic soils varies from about El. +4 along Atlantic Avenue to El. -15 along the northeastern limits of the property, beneath Boston Harbor. In general, moderately good bearing soils are believed to underlie the miscellaneous fill and soft organic soils throughout the site at relatively shallow depths, except where dredging has occurred within present or former boat slips. The natural inorganic soils, as described in the available boring logs, vary from medium stiff clays to dense granular soils and glacial till. Bedrock is probably below El. -70, within the limits of the site.

Proposed construction and existing site conditions, as presently understood, are shown on Figure 4. Ultimately, it will be important to define the extent of existing below-grade structures, i.e., granite walls, building foundations, utilities, and other anomalies which may exist. In addition, the level of suitable bearing soils must also be further defined. It is anticipated that an extensive design-phase subsurface exploration program will be needed in order to determine specific conditions and to obtain samples for testing.

## 3-02. TOWER STRUCTURES ALONG ATLANTIC AVENUE

As part of the proposed development, two mixed-use structures ranging from 7 to 20 stories in height with a common three-level below-grade parking garage, will be located along Atlantic Avenue. The lowest level of parking beneath these structures would be approximately 26 ft. below existing street level. It appears that the soils at and below this level have adequate strength such that the building can be supported directly on a reinforced concrete mat foundation. A mat thickness of approximately 5 to 6 ft. will be required to distribute the structural loads.

Hydrostatic uplift forces must be taken into consideration. It is recommended that all below-grade foundations be designed to resist a maximum hydrostatic level of El. 16, plus an allowance for storm wave forces, where exposed. It appears that permanent soil anchors, or tiedowns, will be required in low-level sections to resist these hydrostatic uplift forces. The design of the soil anchors will have to be consistent with the structural design of the mat to provide a compatible foundation system.

## 3-03. WHARF STRUCTURES

Three bulkhead wharf structures, consisting of residential buildings and an adjacent deck, which project out toward the harbor are proposed not to have basements. The conceived lowest structural floor level is at El. 20 with the adjacent decks at El. 16. Inasmuch as the depth to natural inorganic bearing soils extends considerably deeper, these portions must be supported on pile foundations.

The piles for the residential buildings must be designed to penetrate the existing miscellaneous fill, old structures, organic soils and open water to bear in the dense inorganic, glacial till soils at a depth of 50 to 70 ft. below the structural floor level. It is anticipated that a typical pile capacity of up to 130 tons can be achieved for a 14-inch square prestressed concrete pile unit. Battered (inclined) piles will be included to account for lateral forces imposed by wind shear and the marine environment. Prior to installation of production piles, two or more pile load tests will be required to satisfy the requirements of the Massachusetts State Building Code.

The adjacent deck walkways will be supported on treated timber piles. The piles will bear within the upper 5 to 10 ft. of natural inorganic soil.

## IV. CONSTRUCTION CONSIDERATIONS

### 4-01. GENERAL

The structural condition of the wood, steel, granite and concrete masonry seawall bulkheads which presently retain existing fills, is unknown at this time. Some repair and/or new construction will probably be required. Wooden decks and piles in water areas must be removed to low water level from below new construction to eliminate the potential fire hazard. The existing piles can be cut off rather than pulled, except where they provide obstructions to new construction.

Currently, H&A is providing consulting services to others in connection with the New East Side Interceptor - North Branch. In the vicinity of the Rowes/Fosters Wharf site, the planned interceptor work consists of the 72-inch interceptor and a 48-inch reinforced concrete drain. The proposed alignment of these two items would locate them beneath the existing sidewalk of Atlantic Avenue, generally running adjacent and outside of the property lines for the subject site. However, the alignment of the 48-inch drain line, as presently planned, passes out toward the harbor below the easement at the south end of the site. The layout of the proposed development has been modified to accommodate the planned interceptor work such that they would not conflict with one another, (See Figure 4).

A typical section through the site is shown on Figure 5. This section indicates the completed construction as proposed for this location.

### 4-02. TOWER STRUCTURES ALONG ATLANTIC AVENUE

The excavation for the garage substructure will be retained by an earth retention system installed around its entire perimeter. It appears that a continuous interlocking steel sheet pile system will be required; however, where penetration into dense glacial till soils is not practical, the use of soldier pile and lagging may be necessary below the toe of the steel sheeting. Sheeting will require bracing for support, especially along Atlantic Avenue, so as to adequately support the street, sidewalk, and utilities. Lateral soil and water pressures may be resisted by internal bracing or by a system of soil anchors, or tiebacks.

Where excavation for construction is carried below about El. 10, dewatering will be required. It can probably be accomplished by open pumping within the excavation by a nominal system of sump pits. The excavation must be dewatered such that the piezometric water level is below the foundation bearing surfaces during final preparation stages. Pervious drainage layers, protected by filters, must be placed below mat level to permit the continuation of dewatering until there is sufficient dead weight of structure to resist uplift pressures.

Steel sheet piling and soldier piles may encounter obstructions in the form of rubble, buried bulkhead walls, buried wood piles and timbers, and other foundation remnants. It is probable that considerable pre-excavation with a backhoe will be required before sheeting and soldier piles can be driven. Also, prior to installation of soil anchors, a determination will have to be made regarding the presence of utilities or other obstructions.

The existing soils at subgrade bearing level must be carefully examined by the Geotechnical Engineer. Field tests will be made to confirm that the bearing capacity is consistent with design assumptions. If suitable soils are not encountered, it may be necessary to over-excavate and replace with compacted fill or lean concrete.

### 4-03. WHARF STRUCTURES

Pile foundations for structural floors and adjacent decks will probably be driven from the surface of the existing fill. At locations over water, the piles may be driven by barge-mounted equipment or by extending a platform, or working deck, outward from shore as piles are completed. Similar to the steel sheet piling and soldier piles for the excavation support system, the bearing piles extending through fill may also encounter obstructions which will require pre-excavation to facilitate installation.

## 4-04. MARINA FACILITIES

Following and possibly during the site construction, the areas between the wharf structures will be excavated to create part of a proposed fifty-slip marina. These areas will be bounded by existing bulkhead walls where maintained, walls of the below-grade parking garage, and by new permanent bulkheads constructed to support the existing fill, where present.

It should be anticipated, for development purposes, that construction outboard of the seawall, especially where it involves filling, and dredging and disposal for the marinas, will probably require permits from the Corps of Engineers, various agencies of the Commonwealth of Massachusetts, and the City of Boston Conservation Commission.

# V. FOUNDATION CONSTRUCTION COST ESTIMATE AND ASSESSMENT OF "PREMIUM" COSTS

## 5-01. GENERAL

As discussed previously, site and subsurface conditions at the Rowes/Fosters Wharf waterfront parcel are complex. In addition, the proximity to the salt water, the need to design for extreme tidal variations and the higher costs associated with construction of portions over water have been taken into consideration in developing estimates of "premium" costs for completing the proposed foundation construction. The results of these "premium" cost analyses are presented herein.

## 5-02. FOUNDATION CONSTRUCTION COST ESTIMATE

As part of the geotechnical engineering studies performed during the design development process, components of the foundation system design were identified and approximate quantities estimated. This work was based on the proposed construction as well as the site and subsurface conditions as presently understood. Construction costs associated with components requiring site and earthwork activities were then evaluated. Unit costs were estimated from the following sources:

- "Building Construction Cost Data 1982", by Robert Snow Means Company, Inc., 1981.
- Information supplied by local specialty contractors.
- Previous experience of H&A.

Primary components of the foundation system design were classified and grouped into separate categories to complete an estimate of construction costs. The results of the H&A cost estimate were subsequently reviewed by Beacon Construction Company, Inc. (BCC) Adjustments, primarily to unit costs and contingency items, were discussed and made where warranted.

## 5-03. ASSESSMENT OF "PREMIUM" COSTS

The Boston Redevelopment Authority has requested that an estimate be prepared of "premium" costs for foundation construction reflecting those costs that are an extra expense because of this development's waterfront location as compared to the cost for other downtown developments. For the purpose of cost evaluations, the premium cost has been defined as the difference between the estimated site preparation and construction costs for:

1) The Rowes/Fosters Wharf waterfront site, and

2) An urban site within Boston where there are no significant site access or obstruction problems, and subsurface conditions are such that the same structures can bear on conventional foundations.

Another condition which has been imposed on this site is the fact that parking must be provided below ground surface. Some of the costs associated with this have also been considered a "premium".

Previous to the studies reported herein, BBC completed a cost estimate of the proposed development based on the initial conceptual design. As previously described, H&A has now performed an independent estimate of the geotechnical-related aspects of the proposed development which was reviewed with BCC. Based on mutual discussions, an assessment of premium costs has been made in accordance with the above assumptions and is presented in Table III.

The information presented in Table III reflects "premium" costs only and not total project costs for the given items. Premium costs were determined by separate categories as identified and described in the first column of Table III, and were allocated according to the additional categories designated as "subsurface", "surface" or "other".

It should be noted that the premiums determined do not include project costs attributable to extra engineering fees due to this development's waterfront location. These items are difficult to quantify as they will include additional design, engineering, construction and site monitoring costs which are not yet well defined.

# VI. SUMMARY

## 6-01. GENERAL

A preliminary study of probable site preparation and foundation requirements for the Rowes/Fosters Wharf site has been completed. Based upon the available subsurface information site and subsurface conditions are considered extremely complex, primarily because of past dredging, filling and previous wharf and building construction. Nevertheless, moderately good bearing soils which should provide adequate foundation support for the proposed structures, are believed to underlie the site at nominal depths.

## 6-02. CONCLUSIONS

Summarized below are guideline criteria for probable foundation design and construction developed for use in project planning purposes.

- The tower structures with three levels of parking below-grade located along the Atlantic Avenue portion of the site, may be supported on a soil-bearing mat foundation.
- The wharf structures extending outboard towards Boston Harbor will require driven pile foundations.
- All structures must be designed to resist hydrostatic uplift pressures and waterproofed, as necessary, for a maximum water level of El. 16.0, plus effects of wave action as appropriate.
- Excavation for construction carried below-grade will require a continuous earth retention system, adequately braced to resist soil and full hydrostatic pressures. Excavations below about El. 10 will require dewatering by open pumping methods.
- An estimate of "premium" costs for foundation construction due to the development's waterfront location is presented in Table III.

An extensive subsurface investigation program will be required to further determine specific information on site and subsurface conditions needed to develop final foundation design criteria. This subsurface investigation program will probably consist of test pit and test trench excavations, test borings (both on land and over water), groundwater observation wells and other field explorations. In addition, a thorough historical reconnaissance to determine the limits and extent of previous site buildings and construction may also be warranted.

# TABLES

# TABLE I

## SUMMARY OF AVAILABLE SUBSURFACE DATA

| BORING NO. | APPROXIMATE GROUND SURFACE ELEV. (BCB) | APPROXIMATE THICKNESS OF STRATUM, Ft. |  |  |  |  | DEPTH TO BEDROCK, Ft. | DEPTH OF BORING, Ft. |
|---|---|---|---|---|---|---|---|---|
|  |  | FILL | SILT(1) | SAND | CLAY | GLACIAL TILL |  |  |
| B236 | -13.5 | NE | 5.0 | NE | 27.0 | 41.0 | 73.0 | 80.0 |
| B237 | -11.4 | NE | 5.0 | NE | 35.0 | >22.0 | ND | 62.0 |
| B238 | 18.8 | 4.0 | NE | NE | 12.0 | >55.0 | ND | 71.0 |
| B239 | 19.0 | 10.0 | NE | NE | NE | >26.3 | ND | 36.3 |
| B240A | 18.1 | 11.0 | 6.5 | NE | NE | >19.5 | ND | 37.0 |
| B108I | 13.3 | 16.0 | 20.0 | NE | 28.0 | 40.0 | 104.0 | 114.0 |
| B109 | 14.7 | 30.0 | 10.0 | NE | 14.0 | 55.0 | 95.0 | 105.3 |
| B111 | 15.5 | 20.0 | 7.0 | NE | 12.0 | 65.0 | 104.0 | 116.0 |
| B113 | 15.6 | 10.0 | 5.0 | 4.5 | 8.5 | 84.0 | 112.0 | 122.2 |
| B69-10 | -18.0 | NE | 5.0 | NE | ND | ND | ND | 17.0 |
| B69-13 | -10.0 | NE | 7.0 | NE | ND | ND | ND | 20.0 |
| B101 | 14.0 | 7.0 | NE | NE | 18.8 | >36.7 | ND | 61.1 |
| B102 | 14.0 | 10.0 | NE | NE | 22.0 | >28.1 | ND | 60.1 |
| 111 | 13.96 | 14.0 | 9 | NE | NE | >27.0 | ND | 50.0 |
| 112 | 16.67 | 12.0 | 7 | NE | NE | >25.0 | ND | 44.0 |
| 113 | 16.82 | 8.0 | NE | NE | NE | >33.8 | ND | 50.3 |

NOTES:

(1) SILT - Organic silt or peat.
(2) ND - Not determined in boring
(3) NE - Not encountered in boring

## TABLE II

## SUMMARY OF TIDE LEVELS IN BOSTON HARBOR

| WATER LEVEL | DATUM |  |
|---|---|---|
|  | USC&GS MEAN SEA LEVEL (1929) (MSL) | BOSTON CITY BASE (BCB) |
| Mean Low Water | -4.59 | 1.06 |
| Mean Sea Level (1929) | 0.0 | 5.65 |
| Mean High Water | 4.89 | 10.54 |

Estimated frequencies of occurrence of tide levels based on Corps of Engineers' data are as follows:

| FREQUENCY IN YEARS | MSL | BCB |
|---|---|---|
| 10 | 9.1 | 14.75 |
| 50 | 10.0 | 15.65 |
| 100 | 10.3 | 15.95 |
| February 1978 storm | 10.0 | 15.65 |

BRUNING 44.141 35356

| Category and Description of Work | Allocation of Premium Costs | | | Total (1) Premium Cost |
|---|---|---|---|---|
| | Subsurface | Surface | Other | |
| 1. Site Clearing: Demolition and disposal of buildings, deck structures and piling; removal of abandoned utilities, drainage structures and other debris located inside seawall bulkhead and outside of the seawall bulkhead to approximately mean low water level. | - | - | 400,430 | 400,430 |
| 2. Seawall Bulkhead: Inspection and restoration of concrete and granite seawall bulkhead where maintained, construction of new bulkhead where necessary and removal of seawall bulkhead where in conflict with proposed construction. | 1,222,550 | - | - | 1,222,550 |
| 3. Earthwork: Excavation for three level parking garage beneath tower structures. Includes earth retention system consisting of steel sheet piling, soldier beams, lagging and earth anchors in addition to provisions for dewatering during excavation and initial construction. | 3,195,770 | - | - | 3,195,770 |
| 4. Foundation for Tower Structure and Garage: Mat foundation bearing directly on natural inorganic soils and foundation walls. Includes waterproofing for both mat and walls, earth anchors to resist hydrostatic uplift within select areas and backfill around the foundation with structural fill up to design grade. | 1,301,990 | - | - | 1,301,990 |
| 5. Garage Structure: see note (2). | - | - | - | - |
| 6. Wharf Structures: | | | | |
| A. Residential Buildings: Precast pile supports for buildings over fill and water including pile caps, tie-beams, structural slab and water proofing. | 683,400 | 270,000 | - | 953,400 |
| B. Adjacent Deck: Deck supported on treated timber piles primarily over water and around the perimeter of the residential buildings, and providing access to the pavilion structure. | 152,550 | 690,000 | - | 842,550 |
| 7. Utilities: Includes construction of a double slab or utility gallery system to provide support and protection to utility lines from damage due to settlement of the underlying fill where present and/or from exposure to the marine environment. | - | - | 250,000 | 250,000 |
| TOTALS | 6,556,260 | 960,000 | 650,430 | 8,166,690 |

NOTES:

(1) In constant 1983 dollars, includes 18.4% general requirements, overhead, fee and contingency.

(2) Haley & Aldrich, Inc. reviewed design concepts and provided input on the subsurface and earthwork related aspects of this category. The costs of items in this category were evaluated by Beacon Construction Company, Inc. consistent with the building geometry and constraints applied to all other categories with no resultant premium costs assessed. Haley & Aldrich, Inc. did not prepare a similar evaluation of the premium cost items of this category.

ESTIMATE OF PREMIUM COSTS

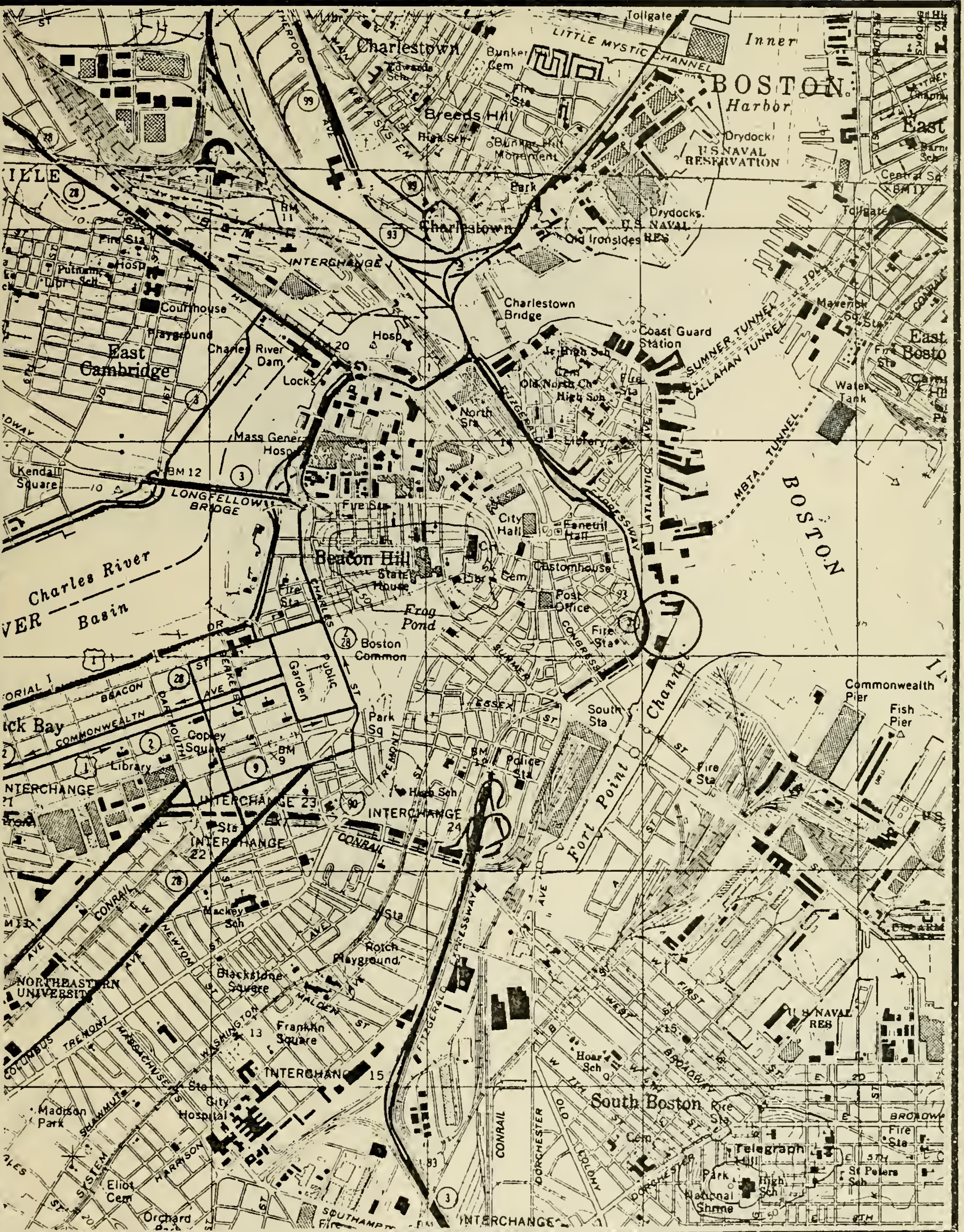
PROPOSED ROWES/FOSTERS WHARF
DEVELOPMENT

BOSTON, MASSACHUSETTS

FILE NO 5072

TABLE III

# FIGURES



**HALEY & ALDRICH, INC.**

CAMBRIDGE, MASSACHUSETTS

N

**PROJECT LOCUS**

U.S.G.S. QUADRANGLE

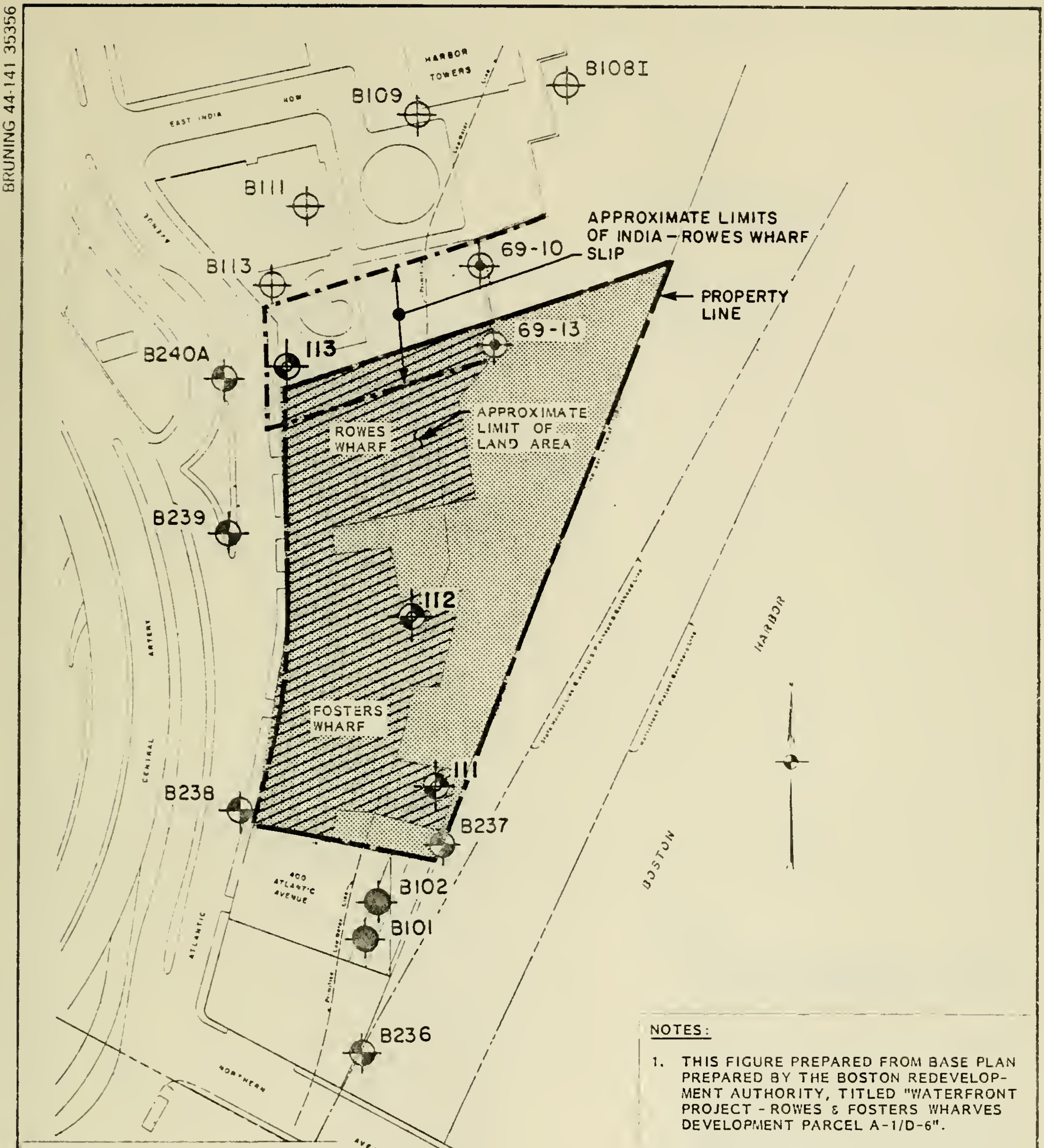
BOSTON SOUTH, MA

APPROXIMATE SCALE 1:25,000

FILE NO. 5072

FIGURE 1

BRUNING 44-141 35356



NOTES:

1. THIS FIGURE PREPARED FROM BASE PLAN PREPARED BY THE BOSTON REDEVELOPMENT AUTHORITY, TITLED "WATERFRONT PROJECT - ROWES & FOSTERS WHARVES DEVELOPMENT PARCEL A-1/D-6".
2. LOCATION OF TEST BORINGS SHOULD BE CONSIDERED APPROXIMATE.

LEGEND:

| | | |
|---|---|---|
| ⊕ | 1967 BORINGS | - RAYMOND CONCRETE PILE |
| ⊕ | 1969 BORINGS | - ATLANTIC TEST BORING CO. |
| ◐ | 1973 BORINGS | - NORTHEAST TEST BORING CO., INC. |
| ◑ | 1980 BORINGS | - JOHN J. BOYLE |
| ● | 1981 BORINGS | - AL SHINER TEST BORING, INC. |

FILE NO 5072

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

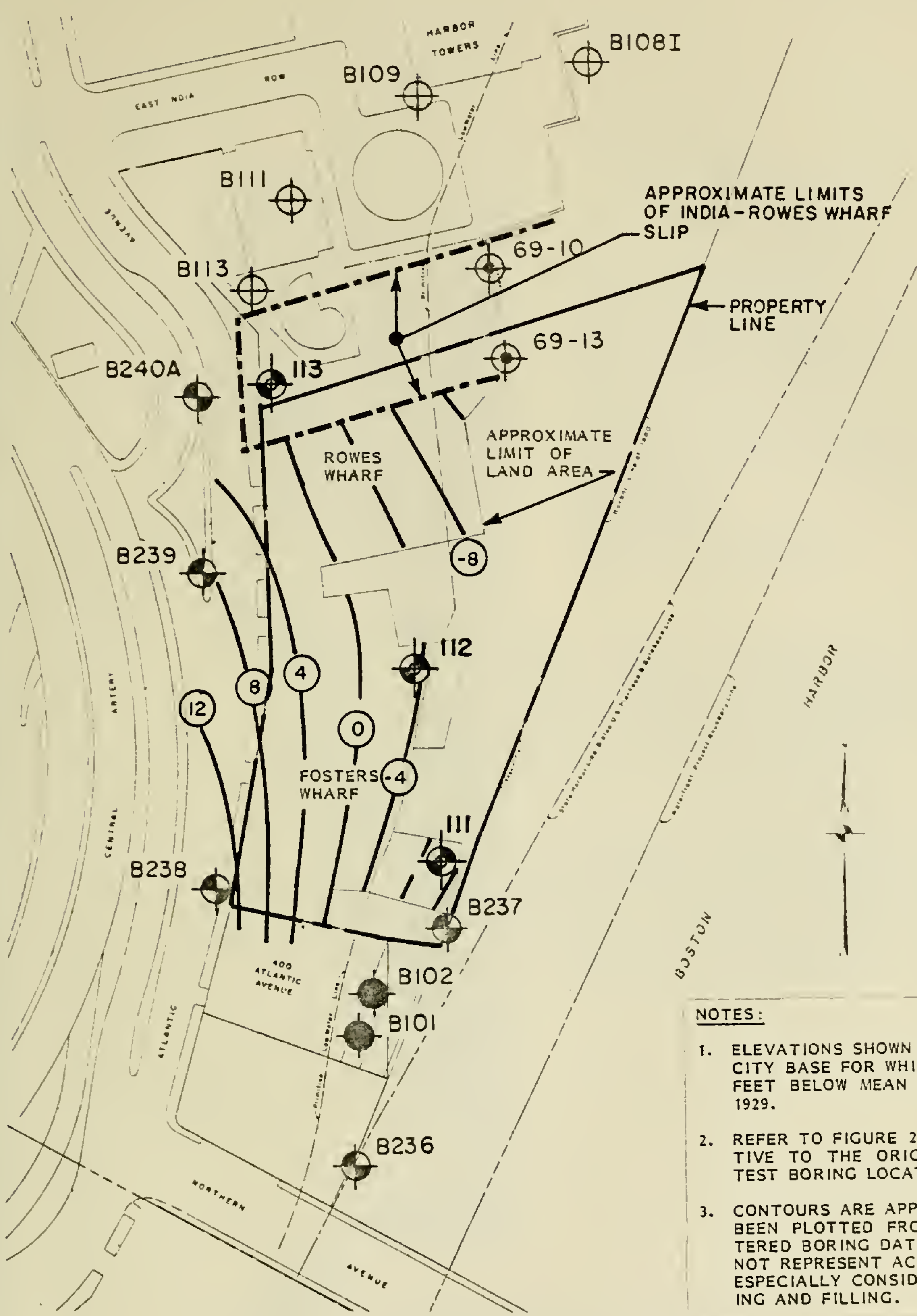
LOCATION PLAN OF AVAILABLE SUBSURFACE EXPLORATIONS

SCALE: 1" = 160'

JAN. 1983

FIGURE 2

BRUNING 44-141 35356



NOTES:

1. ELEVATIONS SHOWN REFER TO BOSTON CITY BASE FOR WHICH EL. 0.0 IS 5.65 FEET BELOW MEAN SEA LEVEL DATUM, 1929.
2. REFER TO FIGURE 2 FOR NOTES RELATIVE TO THE ORIGIN OF PLAN AND TEST BORING LOCATIONS.
3. CONTOURS ARE APPROXIMATE, HAVING BEEN PLOTTED FROM WIDELY SCATTERED BORING DATA AND MAY OR MAY NOT REPRESENT ACTUAL CONDITIONS, ESPECIALLY CONSIDERING PAST DREDGING AND FILLING.

LEGEND:

④ CONTOUR ELEVATION

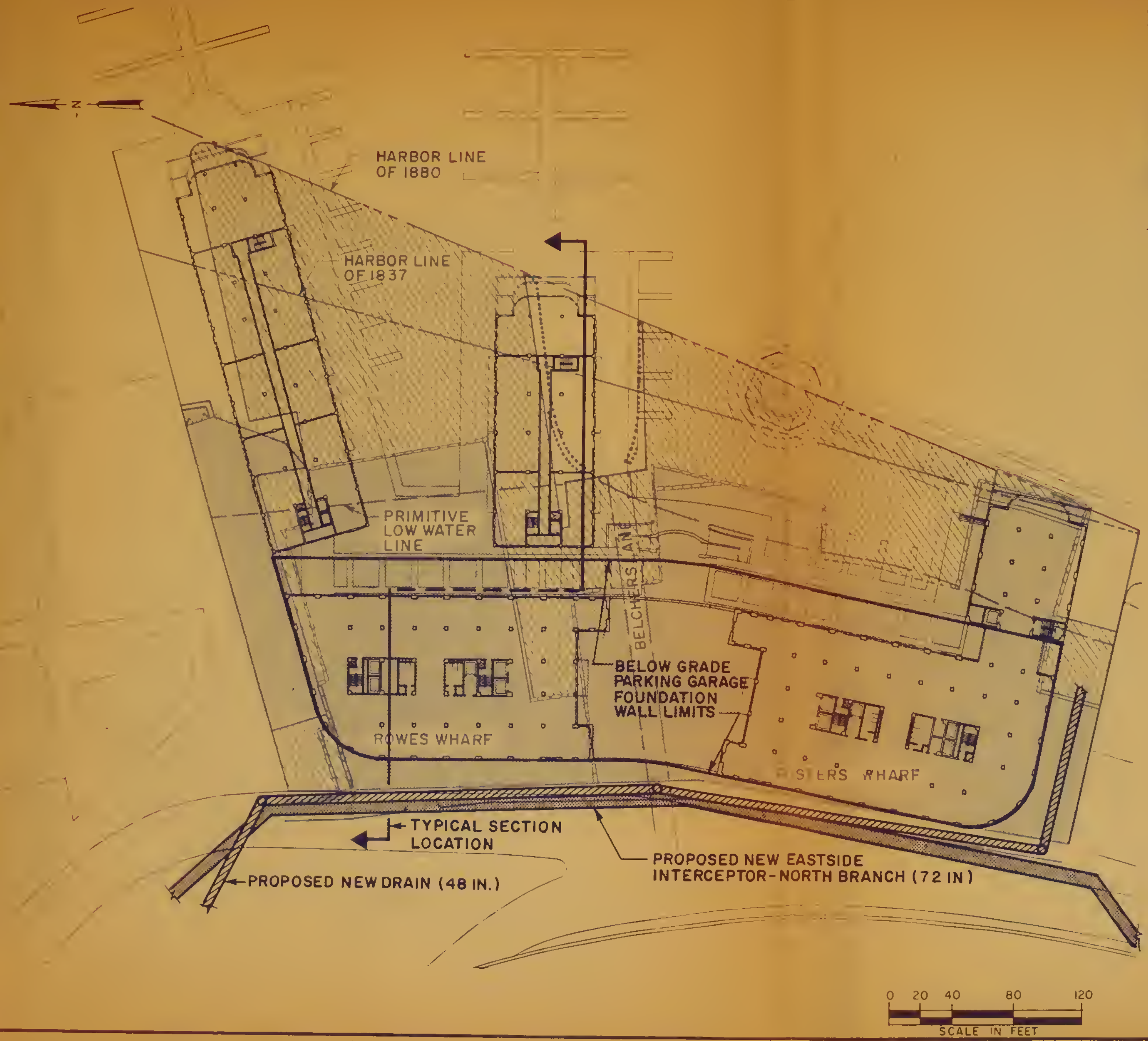
CONTOUR OF
TOP OF INORGANIC
SOIL

SCALE: 1" = 160'  JAN. 1983

FILE NO 5072

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

FIGURE 3



**LEGEND:**

| | |
|---|---|
| ☐ | OPEN AREA |
| ▨ | DECK AREA |
| ▩ | FILLED LAND AREA |

| SYMBOL | BULKHEAD WALLS |
|---|---|
| – – – – – | WOOD SHEET PILING |
| ——— | STEEL SHEET PILING |
| ▭ | CONCRETE ON GRANITE MASONRY |
| –x–x– | GRANITE MASONRY |

**NOTES:**

1. EXISTING CONDITIONS INFORMATION WAS DEVELOPED FROM FIELD OBSERVATIONS, DATA OBTAINED FROM PREVIOUS STUDIES OF THE SITE, AND FOR PROJECTS LOCATED ADJACENT TO THE SITE.
2. LIMITS OF THE PROPOSED ROWES/FOSTERS WHARF OBTAINED FROM DESIGN AND DEVELOPMENT DRAWING ENTITLED "TYPICAL FLOOR PLAN", SCALE: 1" = 16', DATED 12 JANUARY 1983, PREPARED BY SKIDMORE, OWINGS & MERRILL OF CHICAGO, ILLINOIS.

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

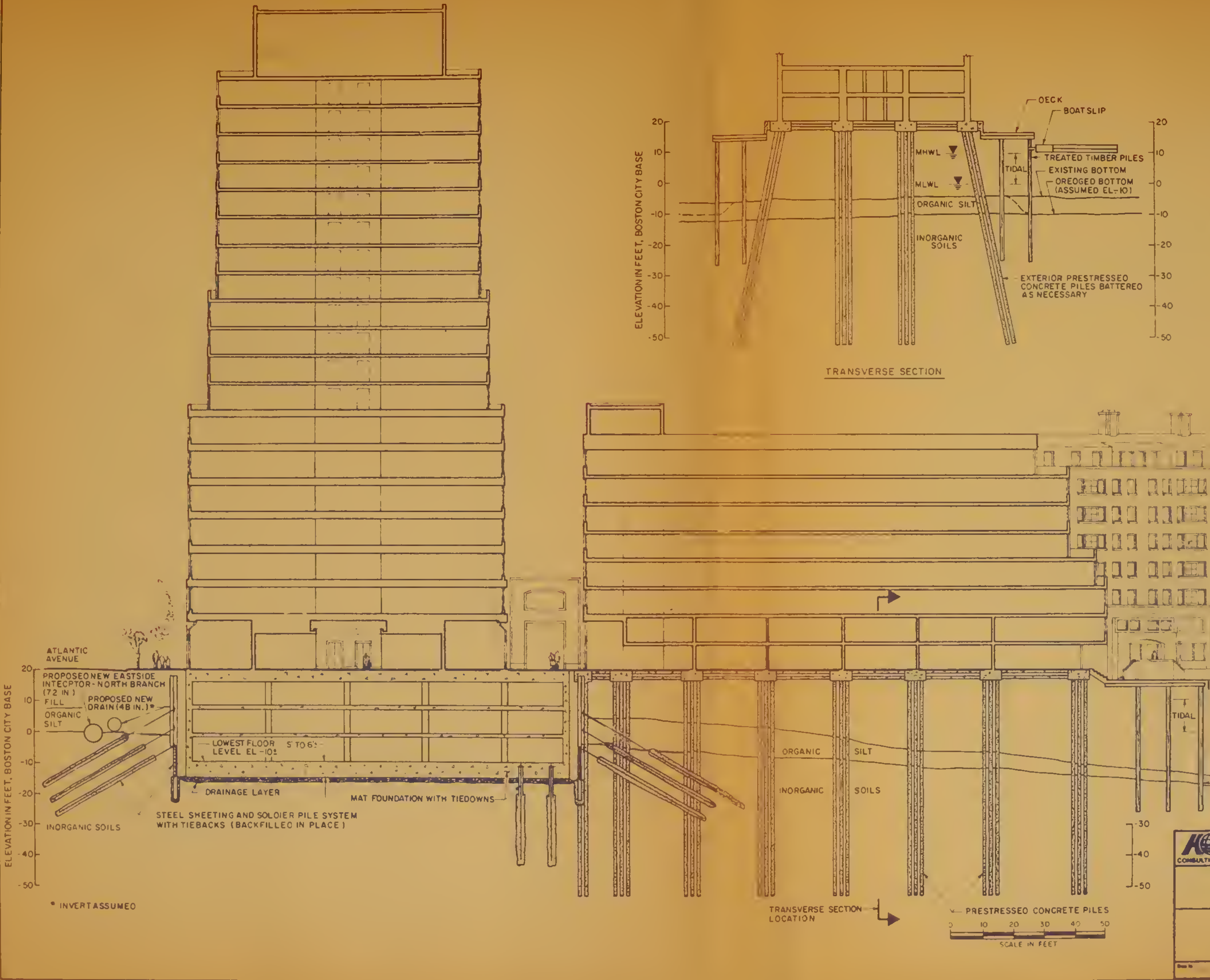
ROWES / FOSTERS WHARF
BOSTON, MASSACHUSETTS

SITE PLAN
EXISTING CONDITIONS AND
PROPOSED CONSTRUCTION

| Scale | Designed By | Drawn By | Checked By | Date |
|---|---|---|---|---|
| AS SHOWN | CRN | EFS | EGJ | JAN 1983 |

FILE NO 5072 C2

FIGURE 4


ELEVATION IN FEET, BOSTON CITY BASE
20
10
0
-10
-20
-30
-40
-50
DECK
BOAT SLIP
MHWL
MLWL
TIDAL
TREATED TIMBER PILES
EXISTING BOTTOM
DREDGED BOTTOM (ASSUMED EL -10)
ORGANIC SILT
INORGANIC SOILS
EXTERIOR PRESTRESSED CONCRETE PILES BATTERED AS NECESSARY
TRANSVERSE SECTION
ATLANTIC AVENUE
PROPOSED NEW EASTSIDE INTECPTOR - NORTH BRANCH (72 IN.)
FILL
ORGANIC SILT
PROPOSED NEW DRAIN (48 IN.)*
LOWEST FLOOR LEVEL EL -10±
5' TO 6'±
DRAINAGE LAYER
MAT FOUNDATION WITH TIEDOWNS
STEEL SHEETING AND SOLDIER PILE SYSTEM WITH TIEBACKS (BACKFILLED IN PLACE)
INORGANIC SOILS
* INVERT ASSUMED
ORGANIC SILT
INORGANIC SOILS
MEAN HIGH WATER LEVEL
MEAN LOW WATER LEVEL
TIDAL
TREATED TIMBER PILES
TRANSVERSE SECTION LOCATION
PRESTRESSED CONCRETE PILES
0 10 20 30 40 50
SCALE IN FEET
5072 06.86

NOTES

1. ELEVATIONS SHOWN REFER TO BOSTON CITY BASE FOR WHICH EL 0.0 IS 5.65 FEET BELOW MEAN SEA LEVEL DATUM [illegible].

2. LIMITS OF PROPOSED ROWES FOSTERS WHARF OBTAINED FROM DESIGN AND DEVELOPMENT DRAWING ENTITLED "E-W SECTION LOOKING NORTH" SCALE 1" = 16' DATED JANUARY [illegible] PREPARED BY SKIDMORE OWINGS & MERRILL OF CHICAGO, ILLINOIS.

3. SEE FIGURE 4 FOR LOCATION OF TYPICAL SECTION

**HALEY & ALDRICH, INC.**
CAMBRIDGE, MASSACHUSETTS
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

ROWES FOSTERS WHARF
BOSTON, MASSACHUSETTS

## TYPICAL SECTION

| Scale | Designed By | Drawn By | Checked By | Date |
|---|---|---|---|---|

FIGURE 5

# APPENDIX A

# APPENDIX A

# LOGS OF AVAILABLE TEST BORING INFORMATION

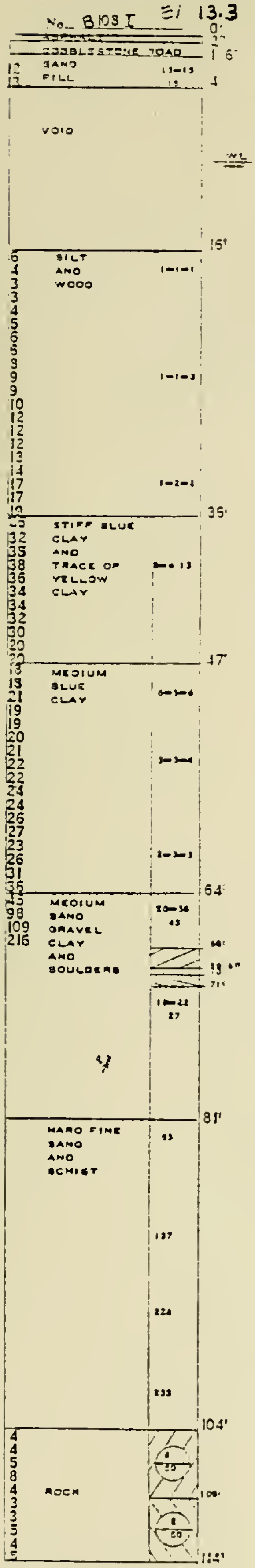
# 1967 BORINGS

# RAYMOND CONCRETE PILE

# RAYMOND
## CONCRETE PILE COMPANY
GOW DIVISION

To BOSTON WATERFRONT ASSOCIATES
C/O HALEY & ALDRICH INC

Date NOVEMBER 21 19 67 Job No ECB-13170-BOS

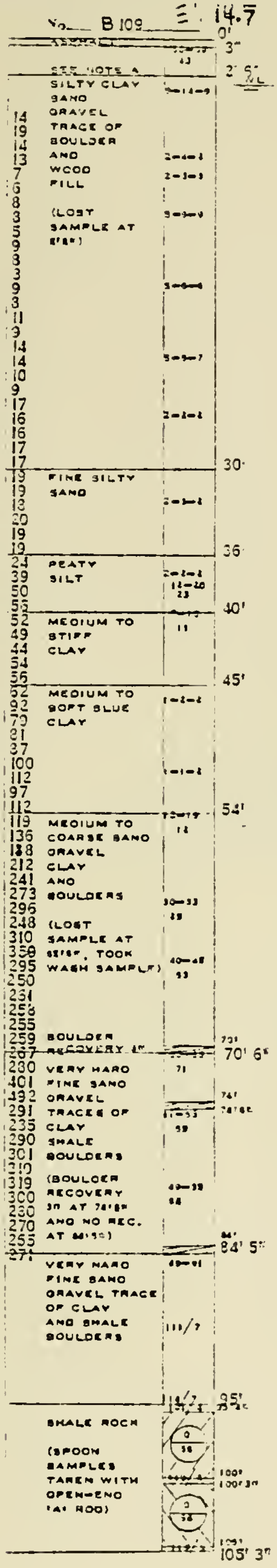


WATER LEVEL NOTED AT 9'6" ON COMPLETION. WATER LEVEL NOTED TIDAL.

98' OF 2.5" CASING USED.

FOREMAN NOTED A 350 LB WEIGHT TO OBTAIN THE SAMPLES TAKEN AT 25.6" AND AT 102 6".

10-2-67
BERNARD RONAN



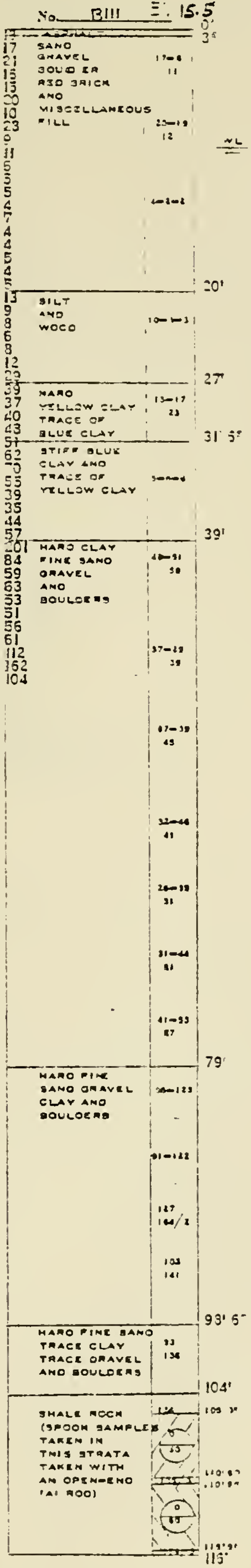
WATER LEVEL NOTED AT 3' ON COMPLETION, WATER LEVEL IS TIDAL.

45' OF 2.5" CASING USED.

NOTE A-COARSE SAND GRAVEL RED BRICK WOOD FILL.

10-5-67
RALPH V. LONG AND
P. QUARATIELLO

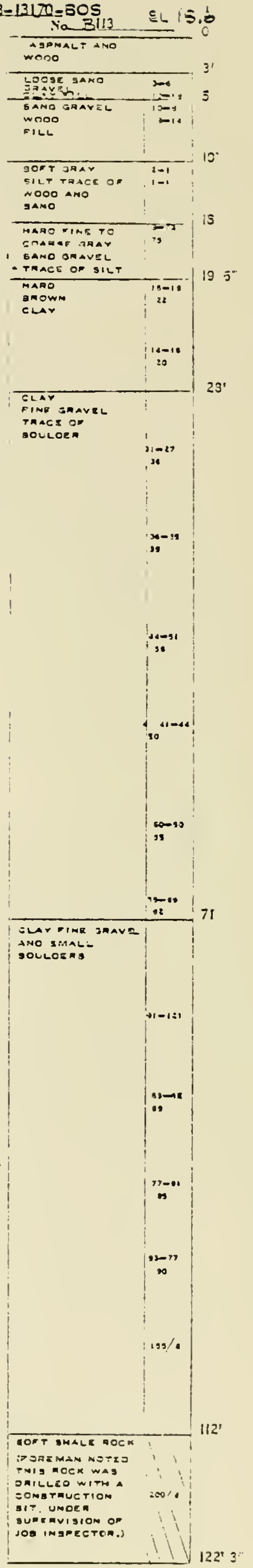
FOREMAN NOTED SAMPLE AT 17'6" SPOON BLOWS REFLECT BOULDER DRIVEN AHEAD OF THE SPOON.



WATER LEVEL NOTED AT 9' ON COMPLETION. WATER LEVEL IS TIDAL.

50' OF 2.5" CASING USED.

10-23-67
ANTHONY SASSO
AND BERNARD RONAN


No. B113
EL 15.6
0
ASPHALT AND WOOD
3'
LOOSE SAND GRAVEL
3-6
12-12
5
SAND GRAVEL WOOD FILL
10-9
3-14
10'
SOFT GRAY SILT TRACE OF WOOD AND SAND
2-1
1-1
15
HARD FINE TO COARSE GRAY SAND GRAVEL TRACE OF SILT
3-72
75
19' 5"
HARD BROWN CLAY
15-18
22
14-18
20
28'
CLAY FINE GRAVEL TRACE OF BOULDER
31-27
36
36-35
39
44-51
58
41-44
50
60-50
55
75-69
62
71
CLAY FINE GRAVEL AND SMALL BOULDERS
91-121
83-48
89
77-81
85
93-77
90
155/4
112'
SOFT SHALE ROCK (FOREMAN NOTED THIS ROCK WAS DRILLED WITH A CONSTRUCTION BIT, UNDER SUPERVISION OF JOB INSPECTOR.)
200/4
122' 3"

WATER LEVEL NOTED TO BE TIDAL.

90' OF 2.5" CASING USED.

## 1969 BORINGS

## ATLANTIC TEST BORING CO.

69-10

## ATLANTIC
## TEST BORING CO.
34 KING STREET, BOSTON 22, MASS.

JOB No. ________ DATE Aug. 29, 1969

Job Address Bulkhead at proposed Towers No. 3

Borings Completed Boston Borings to do Mass.

Fixed datum used is B. C. B.

Ground surface this boring is -18.0' " { higher / lower

| DEPTH FROM | DEPTH TO | CLASSIFICATION BE CAREFUL AND ACCURATE | No. of 30" blows on spoon | Penetration of spoon in inches | LOST WATER |
|---|---|---|---|---|---|
| Ground Surface | -23' | Very soft black + gray | 6" counts | | |
| | | SILT sand, gravel, wood | | | |
| | | fill, (wet) | | | |
| | | S-1. -18' to -23' | Pushed | | |
| -23' | -25' | Stiff yellow + blue | | | |
| | | CLAY (moist) | | | |
| | | S-2. -25.5' to -27' | 8 | 10 | 8 |
| -25' | -34' | Stiff yellow CLAY, | | | |
| | | Trace of coarse gravel, | | | |
| | | (moist) | | | |
| | | S-3. -26' to -27.5' | 7 | 8 | 8 |
| -34' | -35' | Very stiff yellow + blue | | | |
| | | CLAY, with some fine sand | | | |
| | | + coarse gravel (moist) | | | |
| | | S-4. -34' to -35' | 30 | 28 | — |
| | | | | | |
| | | Bottom of boring -35.0' | | | |
| Ground Surface | | Used 2½" casing | | | |

Water level is Tide ft. below Ground surface ________ hrs. after completion

Water level is ________ ft. below Ground surface 24 hrs. after completion

Boring stopped by: ________ Foreman J. Maloney

Boring No. 69-10

WALTHAM SALESBOOK CO., WALTHAM, MASS.

---

69-13

## ATLANTIC
## TEST BORING CO.
34 KING STREET, BOSTON 22, MASS.

JOB No. ________ DATE Aug. 28, 1969

Job Address Rowe's Wharf + India Wharf

Borings Completed ________ Borings to do Boston

Fixed datum used is B.C.B.

Ground surface this boring is -10.0' " { higher / lower

| DEPTH FROM | DEPTH TO | CLASSIFICATION BE CAREFUL AND ACCURATE | No. of 30" blows on spoon | Penetration of spoon in inches | LOST WATER |
|---|---|---|---|---|---|
| Ground Surface | -17' | VERY SOFT BLACK + GRAY | 6" counts | | |
| | | SILT, SAND GRAVEL, GLASS | | | |
| | | FILL (WET) | | | |
| | | S-1 -10' to -17' | Pushed | | |
| -17' | -21' | STIFF YELLOW AND BLUE CLAY | | | |
| | | (MOIST) S-2 -17' to -18.5' | | 9 | 9 |
| -21' | -27' | STIFF YELLOW CLAY, | | | |
| | | (MOIST) S-3, -23' to -24.5' | 7 | 6 | 7 |
| -27' | -30' | VERY STIFF BLUE CLAY, fine Sand | | | |
| | | SOME GRAVEL, SMALL COBBLES, | | | |
| | | (MOIST) S-4 -28' to -30' | 21 | 20 | 26 |
| | | | | | |
| | | BOTTOM OF BORING | | | |
| | | AT EL. -30.0' | | | |
| Ground Surface | | Used 2½" casing | | | |

Water level is Tide ft. below Ground surface ________ hrs. after completion

Water level is ________ ft. below Ground surface 24 hrs. after completion

Boring stopped by: ________ Foreman J. Maloney

Boring No. 69-13

WALTHAM SALESBOOK CO., WALTHAM, MASS.

# 1973 BORINGS

## NORTHEAST TEST BORING CO., INC.

Boring Report

enfeld Associates, Inc
South Street
on, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts
PROJECT NAME Faneuil Hall Project-Mass.R-77
PROJECT NO. Boring Contract No. 4

SHEET 1 OF 2
LOCATION
HOLE NO. 111
LINE & STA.
OFFSET

ROUND WATER OBSERVATIONS
ft. after ______ Hours
completion ( Tidal )
ft. after ______ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | 1 3/8" | |
| Hammer Wt. | 400 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 13.96
DATE FINISH 3-14-7~~2~~ 3(?)
BORING FOREMAN E. Quirk
INSPECTOR
SOILS ENGR.

ATION OF BORING:

| Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | R |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0' | Pavement & Wood | | | |
| | 1'-2' | | | 2 | | | | | | | |
| | 4'-5' | | | 5 | | | | Very loose to loose | | | |
| | | | | | | | | Mixed Fill | | | |
| | | | | | | | | Sand, Silt Clay, Gravel | | | |
| | 9'-10' | | | 4 | | | | & Bricks | | | |
| | | | | | | | 14.0' | | | | |
| | 14'-15' | | | 14 | | | | Wet medium Mixed Fill | | | |
| | | | | | | | | Cinders, Bricks, Sand, | | | |
| | 20'-21' | | | 15 | | | | Gravel & Organic Silt | | | |
| | | | | | | | 23.0' | | | | |
| | 24'-25' | | | 45 | | | | | | | |
| | | | | | | | | Hard brown Clay some | | | |
| | 29'-30' | | | 43 | | | | Silt trace of fine Sand | | | |
| | 34'-35' | | | 41 | | | | | | | |
| | | | | | | | 38.0' | | | | |
| | 38'-39' | | | 19 | | | | | | | |

Blow Counts for Clay

| | | | |
|---|---|---|---|
| 0 - 2 | Very soft | 9 - 15 | Stiff |
| 2 - 4 | Soft | 15 - 30 | Very stiff |
| 5 - 8 | Medium | 30 - | Hard |

Granular Materials

| | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Boring Report

enfeld Associates, Inc

South Street

ton, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts

PROJECT NAME Faneuil Hall Project-Mass.R-77

PROJECT NO. Boring Contract No. 4

SHEET 2 OF 2
LOCATION
HOLE NO. 111
LINE & STA.
OFFSET

ROUND WATER OBSERVATIONS

5 ft. after Hours
at completion ( Tidal )
ft. after Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | $2\frac{1}{2}$" | 1 3/8" | |
| Hammer Wt. | 400 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 13.96
DATE FINISH 3-14-73
BORING FOREMAN E. Quirk
INSPECTOR
SOILS ENGR.

ATION OF BORING:

| e | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Very stiff brown Clay | | | |
| | | 44'-45' | | | 22 | | | | some Silt trace of fine | | | |
| | | | | | | | | | Sand | | | |
| | | | | | | | | 50.0' | | | | |
| | | | | | | | | | Bottom of Hole 50.0' | | | |

| Blow Counts for Clay | | | |
|---|---|---|---|
| 0 - 2 | Very soft | 9 - 15 | Stiff |
| 2 - 4 | Soft | 15 - 30 | Very stiff |
| 5 - 8 | Medium | 30 - | Hard |

| Granular Materials | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Boring Report
oenfeld Associates, Inc.
) South Street
ton, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts
PROJECT NAME Faneuil Hall Project-Mass. R-77
PROJECT NO. Boring Contract No. 4

SHEET 1 OF 2
LOCATION
HOLE NO. 112
LINE & STA.
OFFSET

ROUND WATER OBSERVATIONS
O ft. after ______ Hours
t completion ( Tidal )
__ ft. after ______ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | 1 3/8" | |
| Hammer Wt. | 300 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 16.67
DATE FINISH 3-30-73
BORING FOREMAN P. Manning
INSPECTOR H. Williams
SOILS ENGR.

CATION OF BORING:

| Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | R |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 0.5' | Plank | | | |
| | | | | | | | 12.0' | Bottom of Plank to Top of Fill | | | |
| | 12'-13 | | | 8 | | | | Loose to very loose Mixed Fill, Wood, Fill & Organic Silt | | | |
| | 15'-16 | | | 1 | | | | | | | |
| | | | | | | | 19.0' | | | | |
| | 20'-21 | | | 37 | | | | Compact gray Silt some Gravel & Clay trace of fine Sand | | | |
| | 25'-26 | | | 39 | | | | | | | |
| | 30'-31 | | | 39 | | | | | | | |
| | 35'-36 | | | 48 | | | | | | | |
| | | | | | | | 39.5' | | | | |

Blow Counts for Clay

| | | | |
|---|---|---|---|
| 0 - 2 | Very soft | 9 - 15 | Stiff |
| 2 - 4 | Soft | 15 - 30 | Very stiff |
| 5 - 8 | Medium | 30 - | Hard |

Granular Materials

| | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Boring Report

enfeld Associates, Inc.

South Street

ton, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts

PROJECT NAME Faneuil Hall Project-Mass.R-77

PROJECT NO. Boring Contract No. 4

SHEET 2 OF 2

LOCATION

HOLE NO. 112

LINE & STA.

OFFSET

OUND WATER OBSERVATIONS

ft. after ____ Hours

t completion ( Tidal )

ft. after ____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | 1 3/8" | |
| Hammer Wt. | 300 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 16.67

DATE FINISH 3-30-73

BORING FOREMAN P. Manning

INSPECTOR H. Williams

SOILS ENGR.

ATION OF BORING:

| Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Re |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 -41 | | | 81 | | | | Very compact gray Silt | | | |
| | 43 -44 | | | 147 | | | 44.0' | some fine Sand & Gravel | | | |
| | | | | | | | | Bottom of Hole 44.0'<br>Refusal<br>147 blows 12" 140# H. | | | |

Blow Counts for Clay

| | | | |
|---|---|---|---|
| -2 | Very soft | 9 - 15 | Stiff |
| -4 | Soft | 15 - 30 | Very stiff |
| -8 | Medium | 30 - | Hard |

Granular Materials

| | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Boring Report

hoenfeld Associates, Inc.
0 South Street
ston, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts
PROJECT NAME Faneuil Hall Project-Mass.R-77
PROJECT NO. Boring Contract No. 4

SHEET 1 OF 2
LOCATION
HOLE NO. 113
LINE & STA.
OFFSET

ROUND WATER OBSERVATIONS
ft. after Hours
t completion ( Tidal )
ft. after Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | 1 3/8" | |
| Hammer Wt. | 300 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 16.82
DATE FINISH 3-30-73
BORING FOREMAN P. Manning
INSPECTOR H. Williams
SOILS ENGR.

CATION OF BORING:

| Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | R |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 0.8' | Pavement & Wood Decking | | | |
| | | | | | | | 8.5' | Bottom of Deck to Top of Fill | | | |
| | 8.5'-9.5' | | | 2 | | | 12.0' | Very loose Sand, Silt, Clay & Gravel ( Fill ) | | | |
| | 13'-14' | | | 3 | | | 16.5' | Very loose Mixed Fill some Silt & Gravel trace Sand | | | |
| | 17'-18' | | | 38 | | | 23.0' | Hard brown Clay some Silt & Gravel | | | |
| | 23'-24' | | | 26 | | | | Very stiff gray Clay trace of fine Sand, Gravel & Silt | | | |
| | 29'-30' | | | 29 | | | | | | | |
| | 34'-35' | | | 22 | | | 40.0' | | | | |

Blow Counts for Clay

| | | | |
|---|---|---|---|
| 0 - 2 | Very soft | 9 - 15 | Stiff |
| 2 - 4 | Soft | 15 - 30 | Very stiff |
| 5 - 8 | Medium | 30 - | Hard |

Granular Materials

| | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Proportion used: trace = 0 - 10% some = 20 - 35% and = 35 - 50%

Boring Report

oenfeld Associates, Inc.
South Street
ton, Massachusetts

NORTHEAST TEST BORING CO., INC.
143 WASHINGTON STREET
WEYMOUTH, MASS. 02188

TOWN Boston, Massachusetts
PROJECT NAME Faneuil Hall Project-Mass.R-77
PROJECT NO. Boring Contract No. 4

SHEET 2 OF 2
LOCATION
HOLE NO. 113
LINE & STA.
OFFSET

ROUND WATER OBSERVATIONS

_ ft. after ______ Hours
t completion ( Tidal )
_ ft. after ______ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | ~~1 3/8"~~ | |
| Hammer Wt. | 300 | 140 | BIT |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 16.82
DATE FINISH 3-30-73
BORING FOREMAN P. Manning
INSPECTOR H. Williams
SOILS ENGR.

ATION OF BORING:

| Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 12" on Sampler From 0 - 6 | 6 - 12 | 12 - 18 | To 18 - 24 | Strata Change Depth Elev. | Field Identification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | R |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40'-41 | | | 84 | | | | Very compact gray Silt & Gravel some fine Sand trace of Clay | | | |
| | 45'-46 | | | 92 | | | | | | | |
| | 50'-50. | 3' | | 140 | | | 50.3' | | | | |
| | | | | | | | | Bottom of Hole 50.3'<br>Refusal<br>140 blows 0.3' 140# H. | | | |

Blow Counts for Clay

| | | | |
|---|---|---|---|
| ) - 2 | Very soft | 9 - 15 | Stiff |
| 2 - 4 | Soft | 15 - 30 | Very stiff |
| 5 - 8 | Medium | 30 - | Hard |

Granular Materials

| | | | |
|---|---|---|---|
| 0 - 4 | Very loose | 30 - 50 | Compact |
| 4 - 10 | Loose | 50 - | Very compact |
| 10 - 30 | Medium or Firm | | |

Proportion used: trace = 0 - 10% some = 20 - 35% and = 35 - 50%

# 1980 BORINGS

JOHN J. BOYLE

| | | |
|---|---|---|
| Boring Report<br>Camp Dresser & McKee Inc<br>Boston<br>Massachusetts | John J. Boyle<br>56 Martin Road<br>Milton, Mass.<br>TOWN Boston, Massachusetts<br>PROJECT NAME East Side Interceptor<br>PROJECT NO. Replacement (North Branch) | SHEET 1 OF 2<br>LOCATION<br>HOLE NO. B-236<br>LINE & STA.<br>OFFSET |

GROUND WATER OBSERVATIONS

At . ft. after Hours

Tidal

At ft. after Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | BW | SS | HiCore |
| Size I.D. | 2½" | 1-3/8" | 1-3/8" |
| Hammer wt. | 300 | 140 | BIT. |
| Hammer Fall | 24" | 30" | Diamond |

SURFACE ELEV. -13.5 BCB

DATE FINISH 12/17/80

BORING FOREMAN R. Boyle

INSPECTOR A. BarJosef

SOILS ENGR. Haley & Aldrich Inc

LOCATION OF BORING:

| Depth Below Surface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From 0-6 | 6-12 | 12-18 | To 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0-2 | push | | | | | Soft black muck, silt | 1 | 24" | |
| 5 | | | | | | | 5.0' | | | | |
| | | 5-7 | 5 | 9 | 9 | 10 | | Very stiff gray silty clay | 2 | 24" | |
| 10 | | 10-12 | 3" Tube 15" Recovery | | | | | | | | |
| 15 | | 15-17 | 4 | 5 | 5 | 4 | | Stiff gray silty clay | 3 | 24" | |
| 20 | | 20-21.5 | 3" Tube 16" Recovery | | | | | | | | |
| | | 21.5-23.5 | 3 | 4 | 4 | 4 | | Stiff gray silty clay, trace of coarse sand and fine gravel | 4 | 24" | |
| 25 | | | | | | | | | | | |
| | | 27-29 | 5 | 8 | 9 | 9 | | | 5 | 24" | |
| 30 | | | | | | | | Note: Attempted tube at 30', bent tube. | | | |
| | | | | | | | 32.0' | | | | |
| | | 33.5-35.5 | 40 | 20 | 21 | 28 | | Very stiff gray silt, little coarse to fine sand, trace of fine gravel and clay<br>glacial till | 6 | 24" | |
| 35 | | | | | | | | | | | |

GROUND SURFACE TO ____ FT., USED ____ " CASING; THEN ____ " CASING TO ____ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON

UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-20%, and 50% -40%

HOLE NO. B-236

**Boring Report**

Camp Dresser & McKee Inc

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts

PROJECT NAME East Side Interceptor

PROJECT NO. Replacement (North Branch)

SHEET 2 OF 2

LOCATION

HOLE NO. B-236

LINE & STA.

OFFSET

GROUND WATER OBSERVATIONS

At ____ ft. after ____ Hours

At ____ ft. after ____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | | | |
| Size I.D. | | | |
| Hammer Wt. | | | BIT. |
| Hammer Fall | | | |

SURFACE ELEV.

DATE FINISH

BORING FOREMAN

INSPECTOR

SOILS ENGR.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From–To | Blows per 6" on Sampler From 0-6 | 6-12 | 12-18 | To 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 40-42 | 39 | 38 | 38 | 26 | | | 7 | 24" | |
| 45 | | | | | | | | | | | |
| | | 45-47 | 12 | 18 | 26 | 36 | | | 8 | 24" | |
| 50 | | | | | | | | | | | |
| | | 52-54 | 28 | 31 | 29 | 60 | | | 9 | 24" | |
| 5 | | | | | | | | | | | |
| | | 57.5-59 | 46 | 61 | 68 | | | | 10 | 18" | |
| 60 | | | | | | | | | | | |
| 65 | | | | | | | | Note: Change in color to lighter gray at 63.0'. | | | |
| | | 65.5-65.9 | 120 | | | | | Very compact gray silty coarse to fine sand, little coarse to fine gravel, some decomposed rock fragments<br>glacial till | 11 | 5" | |
| 70 | | | | | | | | | | | |
| | | | | | | | 73.0' | Top of rock 73.0' | | | |
| 75 | | 74-74.2 | 120 | | | | | Cored 74.2' to 80', decomposed Argillite. Very little recovery in core barrel.<br>Note: Sample retained in a jar marked C-1. | 12 | 2" | |
| | | | | | | | 80.0' | | | | |

GROUND SURFACE TO ____ FT., USED ____ " CASING: THEN ____ " CASING TO ____ FT.

Bottom of Hole 80.0'

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% - 40%

HOLE NO. B-236

**Boring Report**

Camp Dresser & McKee Inc
Boston
Massachusetts

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 1 OF 2
LOCATION
HOLE NO. B-237
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At ____ ft. after ____ Hours
Tidal
At ____ ft. after ____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | BW | SS | |
| Size I.D. | 2½" | 1-3/8" | |
| Hammer Wt. | 300 | 140 | BIT. |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. -11.4 BCB
DATE FINISH 12/10/80
BORING FOREMAN R. Boyle
INSPECTOR A. BarJosef
SOILS ENGR. Haley & Aldrich Inc

LOCATION OF BORING:

| Depth Below Surface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From To 0-6 | 6-12 | 12-18 | 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0-5.5 | 2" Tube | | | | | 2" tube taken 5' into black muck under its own weight, then pushed into the clay to create a plug so black muck could be retrieved. | | | |
| | 0 | | | | | | | | | | |
| | 3 | | | | | | | | | | |
| | 2 | | | | | | | | | | |
| 5 | 3 | | | | | | 5.0' | | | | |
| | 12 | | | | | | | | | | |
| | 18 | | | | | | | | | | |
| | 18 | | | | | | | | | | |
| | 38 | | | | | | | | | | |
| 10 | 40 | | | | | | | Medium stiff gray silty clay, trace of fine sand | | | |
| | 40 | 10-12 | 5 | 4 | 4 | 5 | | | 1 | 24" | |
| | 43 | | | | | | | | | | |
| | 44 | | | | | | | | | | |
| | 38 | | | | | | | | | | |
| 15 | 34 | | | | | | | | | | |
| | 28 | 15-17 | 2 | 4 | 4 | 4 | | | 2 | 24" | |
| | 25 | | | | | | | | | | |
| | 21 | | | | | | | | | | |
| | 20 | | | | | | | | | | |
| 20 | 24 | | | | | | | | | | |
| | 25 | 20-22 | 2 | 3 | 4 | 4 | | | 3 | 24" | |
| | 16 | | | | | | | | | | |
| | 15 | | | | | | | | | | |
| | 15 | | | | | | | | | | |
| 25 | 26 | | | | | | | | | | |
| | 21 | 25-27 | 2" Tube 24" Recovery | | | | | | | | |
| | 17 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| 30 | 14 | | | | | | | | | | |
| | 20 | 30-32 | 2 | 3 | 4 | 4 | | | 4 | 24" | |
| | 18 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| 35 | 14 | | | | | | | | | | |
| | 22 | 35-37 | 2 | 3 | 4 | 4 | | | 5 | 24" | |
| | 22 | | | | | | | | | | |
| | 19 | | | | | | | | | | |
| | 21 | | | | | | | | | | |
| | 22 | | | | | | 40.0' | | | | |

GROUND SURFACE TO ____ FT., USED ____" CASING: THEN ____" CASING TO ____ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% -40%

HOLE NO. B-237

| | | |
|---|---|---|
| **Boring Report**<br>Camp Dresser & McKee Inc | John J. Boyle<br>56 Martin Road<br>Milton, Mass.<br>TOWN Boston, Massachusetts<br>PROJECT NAME East Side Interceptor<br>PROJECT NO. Replacement (North Branch) | SHEET 2 OF 2<br>LOCATION<br>HOLE NO. B-237<br>LINE & STA.<br>OFFSET |

| | | | | |
|---|---|---|---|---|
| GROUND WATER OBSERVATIONS<br>At ___ ft. after ___ Hours<br>At ___ ft. after ___ Hours | | CASING | SAMPLER | CORE BAR. |
| | Type | | | |
| | Size I.D. | | | |
| | Hammer Wt. | | | BIT. |
| | Hammer Fall | | | |

SURFACE ELEV.
DATE FINISH
BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From 0-6 | 6-12 | 12-18 | To 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 40-42 | 25 | 19 | 16 | 16 | | Very stiff gray silt, little coarse to fine sand, trace of fine gravel and clay (glacial till) | 6 | 24' | |
| 45 | | 45-47 | 21 | 26 | 38 | 40 | | | 7 | 24" | |
| 50 | | | | | | | | | | | |
| | | 51-53 | 7 | 19 | 26 | 32 | | Very stiff gray silt, little coarse to fine sand, fine gravel and clay | 8 | 24" | |
| 55 | | | | | | | | | | | |
| 60 | | 60-62 | 31 | 31 | 38 | 48 | 62.0' | | 9 | 24" | |
| | | | | | | | | Bottom of Hole 62.0' | | | |

GROUND SURFACE TO ___ FT., USED ___ "CASING; THEN ___ "CASING TO ___ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-20%, and 50% -40%

HOLE NO. B-237

**Boring Report**

Camp Dresser & McKee
Boston
Massachusetts

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 1 OF 2
LOCATION
HOLE NO. B-238
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At____ft. after _____ Hours
Tidal
At____ft. after _____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | BW | SS | Hi-Core |
| Size I.D. | 2½" | 1-3/8" | 1-3/8" |
| Hammer wt. | 300 | 140 | BIT. |
| Hammer Fall | 24" | 30" | Diamond |

SURFACE ELEV. 18.8 BCB
DATE FINISH 12/30/80
BORING FOREMAN D. Pitcher
INSPECTOR A. BarJosef
SOILS ENGR. Haley & Alcrich Inc.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From To 0-6 | 6-12 | 12-18 | 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0' | Granite - curb stone | | | |
| | 6 | 1-3 | 36 | 18 | 6 | 5 | | Medium compact light gray-brown, coarse to fine sand, trace of coarse to fine gravel (fill) | 1 | 24" | |
| | 8 | | | | | | | | | | |
| | 9 | | | | | | 4.0' | | | | |
| | 12 | | | | | | | | | | |
| 5 | 11 | 5-7 | 2 | 1 | 2 | 3 | | Soft gray silty clay, trace of medium to fine sand | 2 | 24" | |
| | 5 | | | | | | | | | | |
| | 5 | | | | | | | | | | |
| | 5 | | | | | | | | | | |
| | 5 | | | | | | | | | | |
| 10 | 8 | 10-12 | 0/12" | 1/12" | | | | Very soft gray silty clay, trace of fine sand | 3 | 24" | |
| | 5 | | | | | | | | | | |
| | 6 | | | | | | | | | | |
| | 7 | | | | | | | | | | |
| | 7 | | | | | | | | | | |
| 15 | 8 | 15-17 | 1 | 4 | 11 | 15 | 16.0' | | 4 | 24" | |
| | 12 | | | | | | | Stiff gray-brown silt, little coarse to fine sand, trace of fine gravel | | | |
| | 31 | | | | | | | | | | |
| | 40 | | | | | | | | | | |
| | 43 | | | | | | | | | | |
| 20 | 30 | 20-22 | 37 | 26 | 22 | 22 | | Very stiff gray-brown silt, little coarse to fine sand and fine gravel | 5 | 24" | |
| | 31 | | | | | | | | | | |
| | 35 | | | | | | | | | | |
| | 40 | | | | | | | | | | |
| | 47 | | | | | | | | | | |
| 25 | 29 | 25-27 | 20 | 25 | 30 | 45 | | | 6 | 24" | |
| | 27 | | | | | | | | | | |
| | 42 | | | | | | | | | | |
| | 53 | | | | | | | | | | |
| | 50 | | | | | | | | | | |
| 30 | 47 | 30-32 | 22 | 26 | 47 | 53 | | Trace of coarse gravel | 7 | 24" | |
| | 45 | | | | | | | | | | |
| | 56 | | | | | | | | | | |
| | 56 | | | | | | | | | | |
| | 57 | | | | | | | | | | |
| 35 | 47 | 35-37 | 15 | 15 | 20 | 22 | | Very stiff gray silt, coarse to fine sand, trace of fine gravel | 8 | 24" | |
| | 47 | | | | | | | | | | |
| | 59 | | | | | | | | | | |
| | 70 | | | | | | | | | | |
| | 69 | | | | | | | | | | |

GROUND SURFACE TO _____ FT., USED _______ " CASING: THEN ______ " CASING TO ______ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% - 40%

HOLE NO. B-238

**Boring Report**

Camp Dresser & McKee
Boston
Massachusetts

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 2 OF 2
LOCATION
HOLE NO. B-238
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At ___ ft. after ___ Hours
At ___ ft. after ___ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | | | |
| Size I.D. | | | |
| Hammer Wt. | | | BIT. |
| Hammer Fall | | | |

SURFACE ELEV.
DATE FINISH
BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From 0-6 | 6-12 | 12-18 | To 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 40-42 | 29 | 38 | 53 | 63 | | | 9 | 24" | |
| 45 | Drilled | Cored | | | | | | | | | |
| 50 | Ahead | Boulders | | | | | | Boulders | | | |
| 5 | | 55-57 | 19 | 27 | 27 | 36 | | Very stiff gray silt, little coarse to fine sand, trace of fine gravel (glacial till) | 10 | 24" | |
| 60 | | | | | | | | Boulders | | | |
| 65 | | | | | | | | | | | |
| 70 | | 69-71 | 36 | 51 | 62 | 74 | 71.0' | Glacial till | 11 | 24" | |
| | | | | | | | | Bottom of Hole 71.0' | | | |

GROUND SURFACE TO ___ FT., USED ___ " CASING: THEN ___ " CASING TO ___ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% -40%

HOLE NO. B-238

**Boring Report**

Camp Dresser & McKee Inc.
Boston
Massachusetts

**John J. Boyle**
**56 Martin Road**
**Milton, Mass.**

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 1 OF 1
LOCATION North Branch
HOLE NO. B-239
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At ____ ft. after ____ Hours
20' at 10:30 A.M. 1/2/81
25' casing in ground
At ____ ft. after ____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | Steel | SS | |
| Size I.D. | 2½" | 1 3/8" | |
| Hammer Wt. | 370# | 140# | BIT. |
| Hammer Fall | 20" | 30" | |

SURFACE ELEV. 19 BCB
DATE FINISH 1/2/81
BORING FOREMAN D. Churchill
INSPECTOR Greg Morley
SOILS ENGR. Haley & Aldrich

LOCATION OF BORING:

| Depth Below Surface | Casing Blows per foot | Sample Depths From–To | Blows per 6" on Sampler From 0-6 | 6-12 | 12-18 | To 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | | | | | | 1' | Blacktop & base - Drove boulder buster | | | |
| | 11 | 1'-3' | 9 | 14 | 14 | 12 | | Sand and gravel fill | 1 | | |
| | 15 | | | | | | | | | | |
| | 23 | | | | | | | | | | |
| 5' | 16 | | | | | | 5' | | | | |
| | 5 | 5'-7' | 2 | 4 | 12 | 17 | | Fill (silty fine brown sand, some gravel, layers of oily sand) | 2 | | |
| | 11 | | | | | | | | | | |
| | 10 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| 10' | 16 | | | | | | 10' | | | | |
| | 7 | 10'-12' | 3 | 7 | 4 | 11 | | Stiff brown silt, trace of fine gravel, coarse to fine sand | 3 | | |
| | 15 | | | | | | | | | | |
| | 19 | | | | | | | | | | |
| | 23 | | | | | | | | | | |
| 15' | 18 | | | | | | 15' | | | | |
| | 27 | 15'-17' | 9 | 133 | 130 | 141 | | Very stiff brown coarse to fine sandy silt, little coarse to fine gravel | 4 | | |
| | 33 | | | | 370# | H | | | | | |
| | 39 | | | | | | | | | | |
| | 41 | | | | | | | | | | |
| 20' | 49 | | | | | | | | | | |
| | 50 | 20'-22' | 22 | 25 | 22 | 30 | | No recovery | 5 | | |
| | 40 | 22'-23' | | overdrove | | | | No recovery | | | |
| | 48 | | | | | | | | | | |
| | 46 | | | | | | | | | | |
| 25' | 49 | | | | | | 25' | | | | |
| | 47 | 25'-27' | 14 | 21 | 23 | 17 | | Very stiff brown-gray silt, little coarse to fine sand, trace of gravel | 6 | | |
| | 56 | | | | | | | | | | |
| | 61 | | | | | | | | | | |
| | 68 | | | | | | | | | | |
| 30' | 72 | | | | | | | | | | |
| | 97 | 30'-32' | 17 | 41 | 73 | | | | 7 | | |
| | 121 | | | | | | | | | | |
| | 133 | | | | | | | | | | |
| | 146 | | | | | | | | | | |
| 35' | 153 | | | | | | | | | | |
| | | 35'-36' | 40 | 90 | 120/4" | | 36'-4" | | 8 | | |
| | | | | | | | | Refusal at 36'-4" | | | |

GROUND SURFACE TO ____ FT., USED ____ " CASING: THEN ____ " CASING TO ____ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% -40%

HOLE NO. B-239

## Boring Report

Camp Dresser & McKee
ᵀoston
assachusetts

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 1 OF 1
LOCATION
HOLE NO. B-240
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At ____ ft. after ____ Hours
8.5' at Completion
At ____ ft. after ____ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | BW | SS | |
| Size I.D. | 2½" | 1-3/8" | |
| Hammer Wt. | 300 | 140 | BIT. |
| Hammer Fall | 24" | 30" | |

SURFACE ELEV. 18.0 BCB
DATE FINISH 12/30/80
BORING FOREMAN D. Bodah
INSPECTOR A. BarJosef
SOILS ENGR. Haley & Aldrich Inc.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From To 0-6 | 6-12 | 12-18 | 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | | | | | | | 4" Concrete slab | | | |
| | 4 | 1-3 | 96 | 91 | 97 | 95 | | Very compact light gray coarse to fine sand, little coarse to fine gravel (fill) | 1 | 24" | |
| | -0 | | | | | | | | | | |
| | 15 | | | | | | | | | | |
| 5 | 8 | | | | | | | | | | |
| | 6 | 6-8 | 9 | 8 | 9 | 9 | | Very stiff light brown coarse to fine sandy silt, trace of fine gravel (fill) | 2 | 24" | |
| | 7 | | | | | | | | | | |
| | 8 | | | | | | | | | | |
| | 7 | | | | | | | | | | |
| 10 | 7 | | | | | | | | | | |
| | 7 | | | | | | 11.0' | | | | |
| | 15 | 11-13 | 9 | 7 | 6 | 8 | | Stiff dark gray silt, little fine sand, wood fragments, trace of organic odor | 3 | 24" | |
| | 22 | | | | | | | | | | |
| | 16 | | | | | | | | | | |
| 15 | 16 | | | | | | | | | | |
| | 20 | | | | | | | | | | |
| | 19 | 16-18 | 52 | 86 | 77 | 60 | | | 4 | 24" | |
| | 20 | | | | | | 18.0' | | | | |
| | 30 | | | | | | | Bottom of Hole 18.0'<br>Note: Spoon recovered 24" of wood. Boring abendoned due to large stump or pile at 16'. Boring relocated 1.5' from original location. See B-240 A for S5-S9. | | | |

GROUND SURFACE TO ____ FT., USED ____ " CASING; THEN ____ " CASING TO ____ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% -40%

HOLE NO. B-240

**Boring Report**

Camp Dresser & McKee
oston
assachusetts

John J. Boyle
56 Martin Road
Milton, Mass.

TOWN Boston, Massachusetts
PROJECT NAME East Side Interceptor
PROJECT NO. Replacement (North Branch)

SHEET 1 OF 1
LOCATION
HOLE NO. B-240A
LINE & STA.
OFFSET

GROUND WATER OBSERVATIONS
At ___ ft. after ___ Hours
At ___ ft. after ___ Hours

| | CASING | SAMPLER | CORE BAR. |
|---|---|---|---|
| Type | | | |
| Size I.D. | | | |
| Hammer wt. | | | BIT. |
| Hammer Fall | | | |

SURFACE ELEV. 18.1 BCB
DATE FINISH
BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

| epth elow urface | Casing Blows per foot | Sample Depths From-To | Blows per 6" on Sampler From To 0-6 | 6-12 | 12-18 | 18-24 | Strata Change Depth Elev. | Field Indentification of Soil. Remarks (incl. color, loss of wash water, seams in rock, etc.) | SAMPLE No. | Pen | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Drove casing to 16', see B-240 | | | |
| 5 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| | | | | | | | 16.0' | | | | |
| | | 16-17.5 | 31 | 21 | 26 | | | Very compact dark gray silty coarse to fine sand, wood fragments, trace organic odor | 5 | 18" | |
| | | 17.5-18 | 24 | | | | 17.5' | | 5A | 6" | |
| 20 | | | | | | | | | | | |
| | 32 | | | | | | | Very stiff light brown clayey silt, little coarse to fine sand, trace of fine gravel | | | |
| | 35 | 21-23 | 25 | 31 | 47 | 90 | | | 6 | 24" | |
| | 37 | | | | | | | | | | |
| | 46 | | | | | | | Very stiff brown-gray silt, little coarse to fine sand, little fine gravel | | | |
| 25 | 27 | | | | | | | | | | |
| | 86 | | | | | | | | | | |
| | 40 | 26-28 | 25 | 37 | 59 | 77 | | Very stiff brown-gray silt, little coarse to fine sand and fine gravel | 7 | 24" | |
| | 39 | | | | | | | | | | |
| | 42 | | | | | | | | | | |
| 30 | 49 | | | | | | | | | | |
| | 50 | | | | | | | | | | |
| | 43 | 31-33 | 51 | 57 | 61 | 60 | | | 8 | 24" | |
| | 41 | | | | | | | | | | |
| | 49 | | | | | | | | | | |
| 35 | 66 | | | | | | | Trace of decomposed rock fragments | | | |
| | 80 | | | | | | | | | | |
| | | 36-37 | 100 | 120 | | | 37.0' | | 9 | 12" | |
| | | | | | | | | Bottom of Hole 37.0'<br>24.5'observation well installed in completed borehole | | | |

GROUND SURFACE TO ___ FT., USED ___ " CASING: THEN ___ " CASING TO ___ FT.

D = DRY W = WASHED C = CORED P = PIT A = AUGER UP = UNDISTURBED, PISTON
UB = UNDISTURBED, BALL CHECK V = VANE TEST

Proportions used: trace = 10% or less, some = 40-70%, and 50% -40%

HOLE NO. B-240A

# 1981 BORINGS

## AL SHINER TEST BORING, INC.

|  |  |
|---|---|
| ATE START | 3/3/91 |
| ATE FINISH | 3/5/81 |
| /EIGHT OF HAMMER | 140 350 |
| FIGHT OF FALL | 30" 24" |

GROUND WATER OBSERVATION

| DATE | TIME | DEPTH |
|---|---|---|
|  | Tidal |  |
|  |  |  |

|  |  |
|---|---|
| AMPLER O.D. | 2" I.D. 1-3/8" |
| YPE OF RIG | B-40 |

# TEST BORING LOG

# AL SHINER TEST BORING, INC.

BOX 142
MELROSE, MASS. 02176
(617) 665-0862

CLIENT

Haley & Aldrich, Inc.
238 Main Street
Cambridge, MA

SHEET 1 of 3

|  |  |
|---|---|
| PROJ NO. |  |
| LOCATION | 390 Atlantic Ave |
| FILE NO | 2603 |
| OFFSET |  |
| GROUND ELEVATION | 14.0 BCB (TOP OF PIER) |
| HOLE NO | 101 |

|  | CASING | SAMPLER | CORE BARR |
|---|---|---|---|
| TYPE | BW | SS |  |
| SIZE I.D. | 2½" | 1-3/8" |  |

| SCALE IN FEET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
|  | 3" |  |  |  |  | Wood planking. Pier. |
|  |  |  |  |  |  | Void. |
| 5' |  |  |  |  |  |  |
| 10' | 10' |  |  |  | 10' | ▽ |
|  |  |  |  |  |  | Water. |
|  |  |  |  |  |  | Note: Borings started at low tide. |
| 15' | 15' |  |  |  | 15' |  |
|  |  | 12 | 6<br>4 | S1 | 17' | Loose to medium compact, black, medium to fine sand little gravel, organic silt and miscellaneous fill. |
|  |  | 13 | 6<br>8 |  |  |  |
|  |  | 6 |  |  |  |  |
|  |  | 10 |  |  |  |  |
| 20' |  | 10 |  |  | 20' | Fine to coarse, gray sand. Possible fill. |
|  |  | 4 | 5 |  | 20'9" |  |
|  | 22' | 129 |  |  |  |  |
|  |  | 21 |  |  |  | Very stiff, gray to yellow silty clay. |
|  |  | 36 |  |  |  |  |
| 25' | 25' | 21 |  |  | 25' |  |
|  |  | 8 | 5<br>13 | S2 | 27' | Medium to stiff, gray silty clay. |
|  |  | 18 | 18<br>29 |  |  |  |
|  |  | 17 |  |  |  |  |
|  |  | 25 |  |  |  |  |
| 30' |  | 29 |  |  |  |  |

Proportions used trace 0 10%, little 10 20% some 20 35%, and 35 50%

|  |  |
|---|---|
| DRILLER | L. Knox |
| HELPER | Mark |
| SOILS ENGINEER | George G |

| SAMPLE TYPE |  |
|---|---|
| C | Cored W · Washed |
| SS | Split spoon |
| UP | Undisturbed piston |
| TP | Test Pin |

| COHESIONLESS DENSITY |
|---|
| 0 4 very loose |
| 4 10 loose |
| 10 30 medium compact |
| 30 50 compact |

| COHESIVE CONSISTENCY |
|---|
| 0 2 very soft |
| 2 4 soft |
| 4 8 medium stiff |
| 8 15 stiff |

TOTAL FOOTAGE

Earth Boring 76'2"
Rock Coring ____ "

# TEST BORING LOG

**AL SHINER TEST BORING, INC.**
P.O. BOX 142
MELROSE, MASS. 02176
(617) 665-0852

| | |
|---|---|
| HOLE NO. | 101 |
| PAGE 2 OF 3 | |

| CALE IN EET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
| | | | 7<br>7<br>9<br>9 | S3 | 30'<br>32' | Very stiff, gray to yellow silty clay. |
| | 33' | | | | | |
| 35' | | | 3<br>3<br>4<br>5 | S4 | 35'<br>37' | Medium to stiff, gray silty clay. |
| 40' | 39'6" | | 13<br>13<br>13<br>17 | S5 | 40'<br>42' | Medium dense, yellow clayey silt, little medium to fine sand, trace fine gravel. |
| 45' | | | 21<br>21<br>27 | S6 | 45'<br>46'6" | Dense, gray coarse to fine sand, little silt, trace clay. (disturbed sample) |
| 50' | 49'6" | | | | | |
| 55' | | | 14<br>24<br>31<br>40 | S7 | 55'<br>57' | Very dense, gray silt, little gray clay, little sand, trace gravel, trace boulders. |
| 60' | | | 28<br>28<br>29<br>30 | S8 | 60'<br>62' | |
| 65' | | | | | | |

Proportions used. trace = 0-10%, little = 10-20%, some = 20-35%, and = 35-50%.

LER L. Knox
PER Mark
S ENGINEER
LLING INSPECTOR George C

**SAMPLE TYPE**
C = Cored W = Washed
SS = Split spoon
UP = Undisturbed piston
TP = Test pit
UT = Undisturbed thinwall

**COHESIONLESS DENSITY**
0-4 very loose
4-10 loose
10-30 medium compact
30-50 compact
50+ very compact

**COHESIVE CONSISTENCY**
0-2 very soft
2-4 soft
4-8 medium stiff
8-15 stiff
15-30 very stiff
30+ hard

TOTAL FOOTAGE
Earth Boring 76'2"
Rock Coring
HOLE NO 101

# TEST BORING LOG

**AL SHINER TEST BORING, INC.**
P.O. BOX 142
MELROSE, MASS. 02176
(617) 665-0852

HOLE NO. 101

PAGE 3 OF 3

| CALE IN FEET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
| | | | 15<br>22<br>60<br>51 | S9 | 65'6"<br>67'6" | Very dense, gray silt, little gray clay, little sand, trace gravel, trace boulders. |
| 70' | 69' | | 8<br>10<br>17<br>22 | S10 | 70'<br>72' | Stiff to very stiff, silty clay, little fine sand. |
| 75' | 73' | | 55<br>130<br>125/2" | S11 | 75'<br>76'2" | Very dense, gray fine sandy silt, trace gravel, coarse to medium sand. |
| | 76'2" | | | | | Refusal at 76'2" (AS MEASURED FROM WOOD PIER @ EL. +13.2 M.L.W)<br>+14.01 BCB |
| 80' | | | | | | |
| 85' | | | | | | |
| 90' | | | | | | |
| 95' | | | | | | |
| 100' | | | | | | |

Proportions used: trace = 0-10%, little = 10-20%, some = 20-35%, and = 35-50%.

LLER L. Knox
LPER Mark
ILS ENGINEER
ILLING INSPECTOR George C

**SAMPLE TYPE**
C = Cored W = Washed
SS = Split spoon
UP = Undisturbed piston
TP = Test pit
UT = Undisturbed thinwall

**COHESIONLESS DENSITY**
0-4 very loose
4-10 loose
10-30 medium compact
30-50 compact
50+ very compact

**COHESIVE CONSISTENCY**
0-2 very soft
2-4 soft
4-8 medium stiff
8-15 stiff
15-30 very stiff
30+ hard

TOTAL FOOTAGE
Earth Boring 76'2"
Rock Coring ——
HOLE NO 101

E START 3/4/81

E FINISH 3/5/81

GHT OF HAMMER 140 350

IHT OF FALL 30" 24"

GROUND WATER OBSERVATION

| DATE | TIME | DEPTH |
|---|---|---|
| | Tidal | |
| | | |

IPLER O.D. 2" I.D1-3/8"

E OF RIG B-40

# TEST BORING LOG

# AL SHINER TEST BORING, INC.

BOX 142
MELROSE, MASS. 02176
(617) 665-0652

CLIENT

Haley & Aldrich, Inc.
238 Main Street
Cambridge, MA

SHEET 1 of 3

PROJ NO.

LOCATION 390 Atlantic Av

FILE NO 2003

OFFSET

GROUND ELEVATION 14.0 BCB (TOP OF PIER)

HOLE NO 102

| | CASING | SAMPLER | CORE BARR |
|---|---|---|---|
| TYPE | BW | SS | |
| SIZE I.D. | 2-3/8" | 1-3/8" | |

| ALE ET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
| | 3" | | | | | Wood plankings. Pier. |
| ' | | | | | | |
| | | | | | | Void. |
| 0' | | | | | | |
| 5' | | | | | 15' | |
| | | | 3 | S1 | | |
| | 16' | | 1 | | | |
| | | | 1/12" | | | |
| | | | | | 18'6" | Soft, black fine sandy silt, wood and miscellaneous fill. |
| | | | 1 | | | |
| | | | 1 | S2 | 18'6" | |
| | | | 1 | | | |
| 0' | | | 2 | | 20'6" | |
| | | | 7 | | | |
| 25' | | | | | 25' | |
| | | | 2 | | | |
| | 26' | 10 | 2 | S3 | | |
| | | 11 | 5 | | | |
| | | | 11 | | 27' | Very stiff, gray silty clay. |
| | | 22 | | | | |
| | | 27 | | | | |
| 30' | | 28 | | | | |

Proportions used trace 0 10%, little 10 20%, some 20 35%, and 35 50%

RILLER L. Knox

ELPER Mark

OILS ENGINEER

SAMPLE TYPE

C Cored W Washed
SS Split spoon
UP Undisturbed piston

COHESIONLESS DENSITY

0 4 very loose
4 10 loose
10 30 medium compact
30 50 compact

COHESIVE CONSISTENCY

0 2 very soft
2 4 soft
4 8 medium stiff

TOTAL FOOTAGE

Earth Boring 76'1

Rock Coring

# TEST BORING LOG

**AL SHINER TEST BORING, INC.**
P.O. BOX 142
MELROSE, MASS. 02176
(617) 665-0852

HOLE NO. 102
PAGE 2 OF 3

| CALE IN EET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
| | | 32 | 8<br>10 | S4 | 30' | Very stiff, yellow gray clay. |
| | | 27 | 13<br>14 | | 32' | |
| | 33' | 25 | | | | |
| | | 24 | | | | |
| | | 22 | | | | |
| 35' | | 22 | 3<br>3 | S5 | 35' | Medium stiff to stiff, yellow gray clay. |
| | | 18 | 6<br>5 | | 37' | |
| | | 17 | | | | |
| | | 18 | | | | |
| 40' | | 18 | | | | |
| | | 18 | 3<br>4 | S6 | 40' | Medium stiff yellow gray clay. |
| | | 17 | 3<br>3 | | 42' | |
| | | 17 | | | | |
| | | 16 | | | | |
| 45' | | 17 | | | | |
| | | 22 | 2<br>2 | S7 | 45' | |
| | | 21 | 3<br>4 | | 47' | |
| | 48' | 21 | | | | |
| | | 68 | | | | |
| 50' | | 45 | | | | |
| | | | 10<br>14 | S8 | 50' | Very stiff, gray fine sandy silt, little coarse to fine clay, trace fine gravel. |
| | | | 15<br>19 | | 52' | |
| | 54' | | | | | |
| 55' | | | | | | |
| | | | 13<br>20 | S9 | 55'6" | Dense, clayey coarse to fine gray sand, little fine gravel, silt. (sample disturbed) |
| | 57' | | 26<br>26 | | 57'6" | |
| 60' | | | | | | |
| | | | 16<br>21 | S10 | 60' | Dense, gray clayey silt, trace gravel, little coarse to fine sand. |
| | | | 24<br>31 | | 62' | |
| 65' | | | | | | |

Proportions used. trace = 0-10%, little = 10-20%, some = 20-35%, and = 35-50%.

LER L. Knox
PER Mark
.S ENGINEER George C
..ING INSPECTOR

**SAMPLE TYPE**
C = Cored W = Washed
SS = Split spoon
UP = Undisturbed piston
TP = Test pit
UT = Undisturbed thinwall

**COHESIONLESS DENSITY**
0-4 very loose
4-10 loose
10-30 medium compact
30-50 compact
50+ very compact

**COHESIVE CONSISTENCY**
0-2 very soft
2-4 soft
4-8 medium stiff
8-15 stiff
15-30 very stiff
30+ hard

TOTAL FOOTAGE
Earth Boring 76'1"
Rock Coring ___
HOLE NO 102

# TEST BORING LOG

**AL SHINER TEST BORING, INC.**
P.O. BOX 142
MELROSE, MASS. 02176
(617) 665-0852

**HOLE NO.** 102
**PAGE** 3 **OF** 3

| CALE IN EET | STRATA CHANGE | CASING BLOWS PER FOOT | SAMPLER BLOWS PER 6 INCHES | SAMPLE NUMBER | SAMPLE DEPTH RANGE | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|
| | | | 14<br>19<br>28<br>32 | S11 | 65'<br>67' | Dense, gray clayey silt, trace gravel, little coarse to fine sand. |
| | 68' | | | | | |
| 70' | | | 16<br>19<br>24<br>35 | S12 | 70'<br>72' | Dense, fine sandy silt, little clay, coarse to fine sand, trace gravel, trace boulders. |
| 75' | | | 46<br>138 "<br>125/7 1" | S13 | 75'<br>76'1" | |
| | 76'1" | | | | | |
| 80 | | | | | | Refusal at 76'1" |
| 85' | | | | | | |
| 90' | | | | | | |
| 95' | | | | | | |
| 100' | | | | | | |

Proportions used: trace = 0-10%, little = 10-20%, some = 20-35%, and = 35-50%.

LER L. Knox
PER Hark
.S ENGINEER
LLING INSPECTOR George C.

**SAMPLE TYPE**
C = Cored W = Washed
SS = Split spoon
UP = Undisturbed piston
TP = Test pit
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**COHESIONLESS DENSITY**
0-4 very loose
4-10 loose
10-30 medium compact
30-50 compact
50+ very compact

**COHESIVE CONSISTENCY**
0-2 very soft
2-4 soft
4-8 medium stiff
8-15 stiff
15-30 very stiff
30+ hard

TOTAL FOOTAGE
Earth Boring 76'1"
Rock Coring
HOLE NO 102

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